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## ORIGINAL ARTICLES

### THE EFFECTS OF TONSILLECTOMY ON THE ACUTE ATTACK AND RECURRENCE OF RHEUMATIC FEVER\*

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RHEUMATIC heart disease has become the most important condition affecting the immediate and subsequent health of young individuals. Its great cause of mortality in early life, its economic losses during the earning years, and its probable effect upon the heart muscle of older adults, raises it to a position demanding the study of all physicians.

Heart disease as a cause of death in the aged seems to us at present the ultimate result of a worn out mechanism, but how much this destruction is due to early infections and how much to wear and tear, is as yet an unanswered question. The goal to be attained is the discovery of the specific organism of acute rheumatic fever. Whether there is a specific organism, or a combination of the already known bacteria, is the problem. It is not the purpose of this paper to discuss the bacteriological problem; the literature of the day attests the increasing interest which physicians are showing in this question. In the meantime, is there anything we can do to diminish rheumatic infection in the young, and its insidious areas of degeneration in the old?

Focal infection has been extensively studied and written about in recent years and the eradication of foci has been used to clear up a variety of disabilities. The wholesale enucleation of tonsils for many conditions, often without thorough study of the cases, has done much to make physicians sceptical of the value of tonsillectomy. Many good medical and surgical measures have been stampered in an effort to make them cure-alls, and in the rush the real value has been lost sight of.

It is highly essential that we should have clearly in mind the symptoms and signs of acute rheumatic fever, differentiating the types seen in children from those of adults.

In children and young adults we have the rheumatic and infectious group, in middle life

the results of early heart infections, including syphilis and arteriosclerosis, from whatever cause, and in the old age group the general breaking down of the circulation, with frequent involvement of the coronaries.

In this particular discussion we are concerned only with rheumatic heart disease, its causes so far as they are known, and its far-reaching results. We have, therefore, to consider primarily the young age group. Years ago physicians concerned themselves too much with declared cardiac lesions, their correct diagnosis and appropriate treatment. All this, of course, is still necessary and will continue to be throughout the life of all here and for a long time after we are gone, but we hope in a much less degree. The physician of today is not doing his duty to himself and his patients unless he regards every child as a case of *potential heart disease*. Unless we consider every child in our practice in this light, we are merely waiting to treat ultimately the one serious and crippling manifestation of rheumatic fever, viz: rheumatic heart disease. Once the child has entered this class he looks forward to limited usefulness and, eventually, hopeless invalidism.

If we base our conception of rheumatic fever on the adult type we will go far astray in recognizing many of its important manifestations in childhood. The common type with fever, hot, tender and swollen joints, the inflammation moving about from day to day, is not seen so frequently as it was twenty-five years ago. Rheumatism is a loose and general term applied by the laity, and too often by physicians, to any muscular or joint discomfort.

Cardiologists are interested in rheumatism as an infectious disease which occurs in children, and young adults sometimes, as recently pointed out by MacCallum, with a very acute course, more often progressing slowly with several explosions of acute illness in which different symptoms may become especially prominent. Equal stress was laid upon this point by G. F. Still in 1910, when he said that the conception of rheu-

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matism as essentially a joint disease is based on its occurrence in adolescent and adult life; the wider and almost certainly more accurate conception of rheumatism as a general disease, probably of infective origin, is based chiefly on its manifestations in childhood. To measure the frequency of rheumatism in childhood by the number of cases which come under treatment for the articular manifestations is entirely to misunderstand the prevalence of the disease in early life. Often joint symptoms are so slight that comparatively few of the cases in which they occur come under medical observation until the presence of severe cardiac affections, or the more obtrusive phenomena of chorea induce the patients to seek medical advice. How frequently we realize this when taking the past history of a young adult with cardiac disease; no history of joint involvement sufficient to cause attention can be elicited. When joints are affected they may be excessively painful, but we know that in rheumatic fever the joints differ from all other types of rheumatism in affecting the periarticular tissue and not being distinctive as are the joint changes in chronic arthritis, syphilis, tuberculosis, sometimes gonorrhea, and even scarlet fever. No constant bacterium has been found in the joint fluid and the pain subsides leaving the apparently affected joint unchanged. Indeed, rheumatic fever in the young would be of negligible significance were it not for the frequent cardiac sequelae.

The course of rheumatic disease varies so greatly that a physician may easily overlook the condition. It often begins in children with malaise, frequently with tonsillitis, soreness or redness of the throat. There may be only a day or two of illness, perhaps a little effusion into a joint or the adjacent structures, or vague muscular pains. The whole course may be very insidious. There may be anemia, nervousness and irritability which may quickly disappear. A careful physical examination during, or immediately after, these manifestations may reveal a beginning murmur in the heart. The more marked cases are, of course, easy to recognize. A few run a very acute and virulent course, beginning with tonsillitis or sore throat, and may terminate with hyperpyrexia and acute pancarditis.

A source of great danger to the child's heart is the occasional attack of malaise accompanied by varying degrees of fever. The illness drags along for two or three weeks. A careful physical examination several times repeated fails to give objective signs and unless the physician is wary he is apt to pass it as a case of unexplained fever. A few months later the circumstances are repeated. It is our experience that harmless looking tonsils are often the basis of these attacks. Some years ago a young woman on the medical service had a fever lasting three weeks. Typhoid was seriously considered, but one morn-

ing she complained of soreness of one of the tonsils,—an enucleation followed with almost immediate relief.

Rheumatic fever in Southern climates is comparatively rare, as are mitral stenosis and other rheumatic heart diseases. This was brought out in a canvass of the country with regard to the establishment of organized work in the prevention of heart disease. In Northern climates rheumatic fever is much commoner, especially in the British Isles, which probably have the greatest incidence. G. F. Still<sup>1</sup>, whose work in rheumatic heart disease in London is well worth studying, enumerates a large number of subjective and objective signs.

In this country we note particularly tonsillitis, joint and muscle pains, pleurisy, bronchitis, anemia, emaciation, fever, nervousness, irritability, chorea, skin eruptions, rheumatic subcutaneous nodules and the various degrees of cardiac involvement. Still has a great deal to say about rheumatic nodules. They are always in the deep fascia, tendon or periosteum. The skin is always freely moveable over them. They are most frequently found over the olecranon, about the malleoli and patellae, over the spinous processes of the vertebrae, along the superior curved line of the occiput and on the extensor tendons of the fore-arms. They occur in successive crops and may remain for a few days, or many months. (Boas) MacCallum thinks that they are rare in children and much rarer in adults. From our own experience, we think cutaneous manifestations not so rare as nodules.

Chorea is no longer considered an entity, although it is often admitted to the neurological services of hospitals, where it has no more place than the joints of acute rheumatism. MacCallum quotes C. F. Strong, who in analyzing a large number of cases, found that 20% of patients with chorea had organic heart disease. He thought that recurrence of the chorea increased the probability of serious cardiac involvement, and found that when chorea and rheumatism were combined, 70% of the patients had heart disease. The pathology of chorea is still very little known, but recent work seems to show that there are in the central portions of the brain, in the corpus striatum, the optic thalamus and the subthamic region, perivascular infiltrations of cells, which in a sense suggest comparison with the lesions found in epidemic encephalitis. Of the remains of such lesions, after the disappearance of the symptoms, nothing is known. Treatment for chorea is the same as for acute joints—rest, salicylate of soda and the removal of foci.

More than twenty years ago writers began to apologize for the introduction of discussions dealing with focal infections, rheumatic fever and chorea. While the literature is indeed voluminous, the conclusions of many papers are doubtful and often unconvincing. When one approaches the subject today he feels as though he

stepped from the trenches into No-man's Land. One author quotes from the extremists of both camps. At a meeting a physician stated that it was criminal negligence not to remove the tonsils from every child, and that there should be a law making it malpractice for a physician who refuses to carry out this part of his duty. On the other hand, another physician said, "Thank God, no one has yet succeeded in stealing my child's tonsils." Such radicalism displays a viewpoint resting on narrowness of vision.

Boas<sup>2</sup> in an extensive article on rheumatic heart disease, says that many misguided enthusiasts tonsillectomize, as a matter of routine, every patient with heart disease. He states that if the rules for tonsillectomy laid down by St. Lawrence were followed they would condemn every child to tonsillectomy. In the opinion of Boas, most tonsillectomies, whether on sufferers from heart disease, or on others, are unwarranted. He considers the evidence that the removal of tonsils will prevent rheumatism is unconvincing. To make such a sweeping statement that most tonsillectomies are unwarranted is not in accord with the clinical experience of many of us.

Price<sup>3</sup> concluded from twenty years of rural practice that "as a matter of fact, the operation is rarely necessary," and should be done only after the most painstaking examination to determine the necessity thereof.

Goldberger<sup>4</sup> stresses the importance of physical examination and states: "Children whose catarrhal conditions of the upper air passages do not subside after tonsillectomy and adenoidectomy suffer in all probability from accessory nasal sinus disease, the antrum being the most frequently involved sinus." We believe, with Goldberger, that the thorough physical examination is of vast importance, but that all other conditions should be found, or carefully ruled out, before tonsillectomy is performed. If one follows out the rule of thorough physical examination in every case before anything is done, an infected antrum would have been found before tonsillectomy.

While Hunt and Osman<sup>5</sup> believe "that enucleation is not a certain preventive of a recurrence of rheumatic fever" to them it seems probable that although tonsils may be the primary focus of infection, or portal of entry, in the first attack, the infective agent may remain dormant in some other part of the body. Frequent recurrences in patients with heart lesions suggest that the persistent focus may be in the heart itself. One striking point is that Hunt and Osman say nothing about the importance of investigating their cases after tonsillectomy for complete enucleation.

One author who contends that tonsillectomy is generally useless quotes this report in substantiation of his views, but apparently overlooks the fact that Hunt and Osman clearly state that

that primary focus was probably in the tonsil. This report plainly upholds our viewpoint that in many cases the primary focus is not removed early enough, nor is it thoroughly enucleated.

Cohen<sup>6</sup> speaks of the dangers of operation. He had three deaths from local anesthesia, two of which were unexplained, one before and one after operation. He feels that it is impossible to discover the need of tonsillectomy by inspecting the tonsils, but that the history of each case is of great importance and should be studied from its own angle.

Absolute indications for tonsillectomy according to Cohen are: 1. recurrent attacks of tonsillitis, whether of the suppurative or simple variety; 2. when the acute attack is followed by such complications as rheumatism or heart disease.

Alvarez<sup>7</sup> insists that tonsils must not be removed for trivial causes, nor until a thorough study of the case has been made by a competent internist. He gives a long list of diseases for which tonsillectomy was performed with the hope of alleviation, but, of course, with failure in many instances. It would be ideal if such an operation could relieve but a small portion of the diseases for which it has been tried, but it is folly to think that it could. No operation of any sort should be undertaken until the most exhaustive study possible has been made of a case, and this applies to tonsillectomy fully as much as any other.

St. Lawrence<sup>8</sup> studied the effect in 94 children of tonsillectomy on the recurrence of acute rheumatic fever and chorea, in a special children's cardiac clinic, and concluded that complete removal of the tonsils was the most important measure for the prevention of acute rheumatic fever and the allied rheumatic manifestations. One or more attacks of rheumatic fever had occurred in 42 cases before the tonsils were removed. After tonsillectomy there was no recurrence in 35 cases, or 84%. One or more attacks of chorea had occurred before the removal of the tonsils in 40 cases, and there was no recurrence after operation in 20 cases, or 50%. Fifty-eight cases of organic heart disease were present in the series. Twelve of these patients had suffered at least one attack of cardiac failure before the tonsils were removed. One patient suffered one attack afterward.

Janeway<sup>9</sup> stated that he did not consider tonsillectomy a prophylactic panacea, indeed he had grave doubts as to its usefulness after the patient had suffered an attack of rheumatic fever, but he did not allow these doubts to prevent the patient from receiving what benefit the operation might give.

Alexander Lambert, in 1000 consecutive cases of rheumatic fever at Bellevue Hospital, found that 25% were recorded as having septic tonsils and 22% inflamed throats, making a total of 47%.

White<sup>10</sup> in a series of 73 cases of rheumatic

fever in American soldiers, found that 40% showed enlarged or ragged tonsils; while Pemberton in 400 cases of aortitis found the tonsils were the seat of infection in 52%.

The interesting study by Kaiser<sup>11</sup> has received considerable attention and his observations upon the effect of tonsillectomy on rheumatism, chorea and heart disease mainly prompted the writer's study. Kaiser concluded that tonsillectomy offers a child considerable relief from such common complaints as sore throats, head colds and mouth breathing. Tonsillitis and sore throats, were among the most common infections before operation. In the group not operated on the incidence was about the same. However, during the three year period following operation, the incidence was greatly decreased. Of the 1200 children not operated on, 677 complained of frequent attacks of sore throat, as against 64 of the tonsillectomized children. Frequent head colds were reported in 614 of the children not operated on, while in the same number of children operated on, 146 were still subject to frequent head colds. In Kaiser's conclusions he states that operation had not influenced the incidence of chorea and rheumatism, but had shown a lessened incidence of cardiac disease over a period of three years. Fifty-two of the 1200 controls showed heart disease, while in the group operated on there were forty-four cases of heart disease, thirty-one of which existed before operation and only thirteen developed after operation.

The British Ministry of Health published an extensive report in 1924 on the incidence of rheumatic diseases. On page 60 the report discusses tonsillar sepsis as an etiological factor in rheumatic diseases. Male patients of the age group 16-24, with acute rheumatism showed tonsillar sepsis in 49%, and female patients of the age group 16-24, in 36%; male patients of the age group 25-34 in 38%, and female patients 25-34 in 50%. In the male group 16-24, 18% more had frequent attacks of tonsillitis with normal appearing tonsils, and in the female group 16-24, 25%. In the male group 25-34, 25% more had frequent attacks of tonsillitis without abnormal appearance, while there were in the female group 25-34, 5%. These, added to the percents of definite tonsillar sepsis swell the role which the tonsil plays in acute rheumatism. The report states that some allowance should, perhaps, be made for that natural bias which would tend to make a medical observer regard certain cases as normal. But with this reservation, there are tonsils, which in another patient he might pass as normal. There is no mistaking the prominence of the evidence of tonsillar sepsis or the history of it in the case of acute and subacute rheumatism.

The present study was undertaken to see if any data of value could be gathered with special reference to the relation between tonsillectomy,

rheumatism, chorea and rheumatic heart disease.

It is our belief that if acute rheumatism and its sequelae can be reduced, that rheumatic heart disease will be proportionally eliminated. We did not think it possible to find cases that had been in the wards of a large hospital longer than five years ago, although we realize that the longer periods give the most valuable information as to the results of tonsillectomy and its prevention of rheumatic fever. The patients were written to and invited to come to the hospital, where Dr. Freedman examined the oral and nasal conditions, while Dr. Robey went into the histories and examined the hearts. A few could not come to the hospital because of their occupations, or for other good reasons, but these were thoroughly investigated by our social worker.

We collected 910 cases, but of this number we were able to investigate only 454. Public hospital patients move so frequently that it is impossible to trace them, so that we were unable to see many who were patients in the hospital in the fifth and fourth years of the study period. In the shorter periods the numbers increased, but naturally their value in a study of this type lessened.

In the group of 910 cases only those were selected who were discharged from the hospital with a diagnosis of rheumatic fever or chorea. In this group were included a few cases of repeated attacks of tonsillitis and rheumatic heart disease. Any case not having a clear history of rheumatic fever or rheumatic heart disease was excluded. A few cases of arteriosclerotic heart were excluded although a diagnosis of rheumatic fever had been made.

Tonsillectomies have been performed on about 60 cases of acute rheumatic fever, during the height of the attack. None were operated upon until all medical measures, such as full doses of salicylate of soda, diet and rest, had been thoroughly tried and until such measures had proved to be useless. The fever had run much the same course,—joint inflammation recurred and there was, as far as we could observe, no material improvement. The length of time from admission to operation varied from five to eight weeks. Some of these cases did not have rheumatic heart disease, while others entered with it, the result of previous attacks of rheumatism. Some of my hospital colleagues insisted that operation, if they are convinced that operation is necessary, should be deferred until the acute attack has entirely subsided.

Starling<sup>12</sup> while working at the Colchester Military Hospital during the war, was much impressed with the frequent history of tonsillitis, both with and without rheumatism, in the various types of cardio-vascular disease received there. He quotes L. F. Barker, who insists on the removal of enlarged tonsils in most cases of



rheumatic heart disease, but who states that it should be done between, and not during, the attacks, since there is danger of throwing more cocci into the blood. Starling finds that sore throats, unless very severe or often repeated,

the jaw is a more constant proof of tonsillar infection than the appearance of the tonsils themselves. Starling advises enucleation as early in the infection as possible, so as to end the attack, for, as he says, "it must be remembered that the

Total number of cases.....	910
Not found.....	456 or 50%
Seen in Clinic.....	217 or 47%
Investigated by Social Worker.....	197 or 44%
Dead (of cases investigated).....	40 or 9%
Tonsillectomies.....	201
No tonsillectomies.....	253
Number to be considered in this study.....	454

<i>Tonsillectomy</i>	
With no subsequent rheumatism nor chorea.....	139 or 31%
(Care of teeth advised in 7)	
With subsequent rheumatism.....	45 or 10%
(Teeth possible focus in 6)	
With subsequent chorea.....	17 or 4%

<i>No Tonsillectomy</i>	
With no further rheumatism nor chorea.....	160 or 35%
(Poor condition in 15)	
(Tonsillectomy advised in 60)	
With further rheumatism.....	50 or 10%
(Bad dentition in 24)	
(Tonsillectomy advised in 17)	
With further chorea.....	2 or .6%
(Both with rheumatic heart disease)	
Radium treatments.....	1 or .4%
(No further attacks)	
Dead—Heart conditions.....	25
Other causes.....	15
Total no tonsillectomies.....	253

Total tonsillectomies..... 201

Note: Included in above were 32 cases of poor tonsillectomy—

With subsequent rheumatism in.....	9
With subsequent chorea in.....	6
With no other attacks in.....	17

Number of cases with Rheumatic Heart Disease..... 185 or 41%

Rheumatic heart disease <i>after</i> tonsillectomy.....	10 or 5%
(Teeth focus in 1 case)	
Rheumatic heart disease <i>before</i> tonsillectomy.....	93 or 50%
With no further attacks.....	71
With further rheumatism.....	14
(Teeth in 50% of these)	
With further chorea.....	5
Dead.....	3
	93

Rheumatic heart disease with no tonsillectomy.....	82 or 43%
With no further attacks.....	51
With further rheumatism.....	7
With further chorea.....	2
Dead.....	22
	82

Note: Of these 93 cases there were 18 with tonsillar tissue remaining

Lung abscess following tonsillectomy.....	1 or .5%
Tonsillectomy during or just after attack with no subsequent attack.....	129 or 64%
Rheumatism immediately following tonsillectomy.....	14

make little impression upon the patient's mind, and are easily forgotten when reciting his history. He feels that tonsils are the main portal and focus of rheumatic infection and that the presence of enlarged lymphatic glands under

longer the attack lasts, the more extensive the results."

We have arrived independently at the same conclusion as Starling. The question of driving more cocci into the blood by tonsillar operation.

the fear expressed Barker, was thoroughly considered by us before beginning operative treatment. We had to decide whether it was wiser to take the risk, if there was any, of driving more cocci into the circulation or of allowing an infection to continue week by week, with all its dangerous possibilities. It seemed to us that the danger of adding more cocci to a blood stream already constantly carrying many of them was worthy of less consideration than some have given to it. To stand by doing nothing while ordinary treatment failed, not knowing what moment a heart infection might begin, or when a heart already infected might become more seriously damaged, was like watching a building burn without effort to put out the fire.

We feel now that we should have operated much sooner than we did, but in any event not until we had thoroughly studied the case. We arrived at the decision as soon as we could satisfy ourselves, by examination and elimination, that the tonsils harbored the focus. We know that a number of cases will promptly quiet down under full doses of salicylate and bicarbonate of soda combined with rest. This was a process of subduing rheumatic fever in use twenty-five years ago, but what happened was that often as soon as the patient's resistance was again lowered by his activities, mode of living, or both, the process returned. Very little attention was paid to foci of infection. Tonsils, sinuses and teeth were ignored. Patients sometimes had as many as two or three attacks in a year.

Since we believe that repeated attacks of rheumatic fever only add to an already damaged heart, the operation is important. One could treat medically and thoroughly investigate a case in one week as well as in four, and by such procedure be that much earlier in recommending operation.

From these 60 cases we felt that the tonsils were without question the cause of the acute process, because in from two to three days it had quieted down following tonsillectomy. If the tonsils were not responsible why did the symptoms, which had persisted for weeks, quiet down so promptly, not to return? The hot, red, tender joints had continued with only a day or two of remission for weeks. In two cases of marked chorea, one was entirely relieved in forty-eight hours, the symptoms having been just as marked up to the time of operation. In the others, the symptoms slowly subsided until they disappeared at the end of ten days. These cases seen nearly a year later had no return.

In the cases with the acute joints there was no instance where the inflammation was not promptly dissipated. There were no complications such as lung abscess, or disturbances from the anesthetic. The patients accepted operation in most instances quite readily, because they were concerned about stopping their severe

pain, while we were chiefly worried over the possibility of heart involvement. One woman with repeated recurrence of joint inflammation while in the hospital, delayed the operation for two days, because she feared the anesthetic, but finally agreed to it with an excellent result. We heard from her a year later and found that we had freed her from rheumatism and made a most grateful patient besides.

The presence or absence of rheumatic heart disease made no difference when we had once made up our minds that the focus was in the tonsils, and the operation was necessary. In a majority of these cases no demonstrable cardiac involvement could be discovered upon careful physical examination.

In the 13 cases which occurred after operation we would want to ascertain just how the operation was performed and what the condition of the throat was a few weeks after operation. Our examinations showed that enough tonsil was left in a considerable number of cases to make a dangerous focus in those people who were supposed to have had the tonsils thoroughly removed.

A physician examining the figures of this report would be unable to see any material difference between the tonsillectomized and the tonsillectomized cases. Like most statistics on this subject gathered from adult subjects, they are unconvincing. To make the operation of value it is our opinion that it should be performed upon children while the foci of infection are still limited to the tonsils.

#### CONCLUSIONS

1. It is our belief that complete enucleation of the tonsils offers the best preventive of rheumatic fever, and therefore of rheumatic heart disease. That it will prevent every case of rheumatic heart disease is, of course, beyond our expectation.

2. A history of repeated sore throats is of more importance than tonsils which by appearance suggest disease. The British report, and most observers who have made a careful study of the problem, emphasize this point. Repeated sore throats, even with tonsils of normal appearance call for tonsillectomy.

3. The reverse is equally true—that if the tonsils are diseased in appearance, they should be enucleated even in the absence of sore throats.

4. Physicians should have a thorough understanding of the insidious signs of acute rheumatism in its earliest stages, remembering that the disease has wide differences from that seen in adults.

5. Tonsillectomy is a major operation and should be performed only by persons duly qualified by training and experience.

6. Incomplete tonsillectomies leave the patient in as dangerous a situation as before, and

throw discredit upon the value of tonsillectomy as a preventive. Tonsillar remains are often as formidable as the original tonsil.

7. One of the outstanding errors in reasoning seems to be that writers argue that rheumatic heart disease appeared after tonsillectomy had been performed, and therefore tonsillectomy failed as a preventive. It must be remembered that rheumatic heart disease may not declare itself until three or four years after an attack of tonsillitis or rheumatic fever. Furthermore, the mere fact that tonsillectomy was eventually performed indicated the necessity for it—the delay and uncertainty may have made the cardiac damage possible. On the other hand, even a late tonsillectomy will often prevent subsequent attacks and damage to the heart.

8. The prompt subsidence of fever and joint

symptoms following tonsillectomy in cases of acute rheumatic fever has greatly encouraged us to resort to the operation as soon as sufficient study has convinced us that the tonsil is the port of entry. Since operation during the height of the febrile attack has not proved disastrous, as some have feared, in our hands, we hope that it will diminish the possibilities of cardiac involvement.

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## ADENOMYOMA OF THE RECTO-VAGINAL SEPTUM\*

### A Report of Three Cases Treated by Three Different Methods and Their Results

BY JOE VINCENT MEIGS, M.D., F.A.C.S.

In a recent paper<sup>1</sup> (Adenomyomata or tumors composed of endometrial-like tissue) mention was made of three cases of adenomyoma of the recto-vaginal septum. These three cases are reported in detail in the present paper.

#### HISTORY OF LESION

Adenomyoma of the recto-vaginal septum has been described in great detail by Cuthbert Lockyer<sup>2</sup> of England and by T. S. Cullen<sup>3</sup> of Baltimore. Later Dr. John Sampson<sup>4,5,6,7</sup> of Albany in his study of perforating hemorrhagic (Chocolate) Cysts of the Ovary describes adenomyoma of the recto-vaginal septum and definitely associates its etiology with the cysts of endometrial origin he has so well studied.

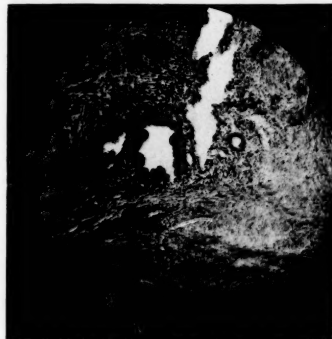
#### DEFINITION

Adenomyoma of the recto-vaginal septum is a tumor of endometrial-like tissue growing behind the cervix which invades the septum between the vagina and rectum. Small in its beginning it gradually enlarges until it can be felt as a large hard tumor bulging into the vagina and penetrating into the lower rectal tissue. It is a tumor of endometrial-like tissue which menstruates and therefore enlarges at each period.

The tumor may be so large that by itself or with associated pelvic adenomyoma it may cause intestinal obstruction, either partial or complete.

It may even break through the vaginal wall,

becoming polypoid in type, and be seen as numerous small red nodules in the posterior vaginal mucosa. If polypoid in type it may cause a flow from the vagina during menstruation.



CASE 1. Showing two endometrial-like glands with typical uterine stroma about them.

#### EXTENT OF DISEASE

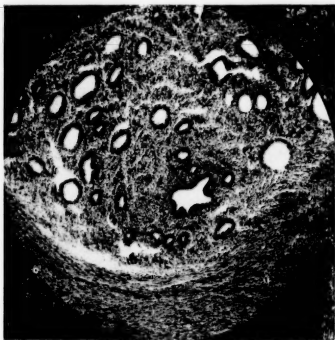
The tumors in this series were definitely located by bimanual examination in the recto-vaginal septum. They may penetrate the vaginal mucosa but probably only rarely do the rectal mucosa. In two of the cases the tumor was also found in the high rectum and was seen and felt when the abdomen was opened. In one the growth of the tumor was described near the right ureter which had to be protected

\*From the East Surgical Service of the Massachusetts General Hospital.

during the operation. Cullen<sup>3</sup> states that one or both ureters may be involved. Sampson noticed that the ovary (cystic) was often involved in the dense tumor masses in the pelvis and that in some cases the tumor in the region posterior to the cervix seemed to be directly connected with the ovarian lesion. Cullen<sup>2</sup> writes as follows in his Case VI "the mucosa of the adenomyoma of the recto-vaginal septum seems to have overflowed to the surface of the adherent ovary."

#### SYMPTOMATOLOGY

From the very nature of the tumor, an invasive lesion in the region of the cervix, in the recto-vaginal septum, in the high rectum and occasionally associated with pelvic pathology (such as an ovarian cyst) the symptoms may be numerous. Constipation, diarrhoea, obstipation, intestinal obstruction, dysmenorrhea, pelvic pain, pelvic nerve pain and even pain in the renal region may all be present due to pressure from the growing tumor especially noticeable at the time of menstruation. Men-



CASE II, FIGURE I. Showing area of adenomyoma of recto-vaginal septum which very closely resembles a section of normal resting endometrium.

orrhagia, local vaginal bleeding and bleeding from the rectum at the time of the catamenia may also be present.

#### ETIOLOGY

In as much as these tumors are composed of endometrial-like tissue it is probable that there is a connection in some way with the normal endometrium. They may arise by direct extension, such as a down growth of adenomyomatous tissue in the uterus into the region behind the cervix or as Sampson<sup>1</sup> suggests they may arise secondarily from an endometrial hematoma (Sampson cyst) of the ovary which becoming adherent to the pelvic peritoneum behind the uterus may allow extension to the tissue behind the cervix in front of the rectum.

Probably both theories are correct and that some arise by direct extension and some by secondary extension through the medium of an ovarian endometrial hematoma.

In Case No. III of this series the slides of the ovary removed at the first operation show definite endometrial-like tissue in the ovary so that it can be assumed that the tumor possibly arose from this cyst after it became fixed in the posterior cul-de-sac.

It is unlikely that there could be a rest of embryonic tissue capable of becoming endometrial-like in this region.

#### PATHOLOGY

The pathology is given in detail in the description in the cases selected. The grayish



CASE II, FIGURE II. Showing the nearness of the adenomyoma to normal rectal mucous membrane. A small section of rectal mucous membrane is seen in the upper part of the photomicrograph.

white tissue of firm consistency with bluish cysts in the structure showing glands similar to endometrial glands is typical of all adenomyomas of uterine origin. The structure is very typical and the microscopical diagnosis is not difficult.

On the following pages are given the detailed histories of these three cases discussed with comments whenever it seemed necessary. The three cases in sequence show the changes of treatment made over a period fourteen years directly due to the admirable work of Cullen and Sampson.

CASE No. I. F. W. West Surgical 181080. Age 30 yrs. White. Married. One child. No abortions.

The patient entered February 16, 1912, complaining of flowing and bloody discharge for six months. She had never had any pain but complained of heaviness in left side and of the anus being "lifeless." Her family history and past history were negative and her periods normal till the present illness.

Abdominal examination was negative. The perineum was intact. On the right side of the vault of vagina beside the cervix were several bright red papillary masses about the size of shoe-buttons. The

cervix was normal. Bimanual examination revealed a mass beside the cervix approximately the size of a large plum. The uterus was in second degree of retroversion.

Proctoscopy showed nothing abnormal in the mucosa of the rectum.

A preliminary diagnosis of carcinoma of the vagina was made and a piece removed for pathological examination. The pathological report follows:—"The tissue is firm and fibrous and not sharply differentiated. In it are numerous small soft glandular looking points. Microscopical examination showed a growth of fibrous and muscular tissue between which is a tissue composed of round cells slightly elongated and throughout which are numerous tubular glands of slightly irregular size and shape." A diagnosis of fibromyoadenoma was made at that time.

An operation was then performed and in the pelvis a tumor mass the size of a pullet's egg found covered with adhesions and adherent between the posterior vaginal wall and rectum. The peritoneum was divided on the right side of the cervix and a mass dissected free from the subcutaneous tissues exposing the upper part of the wall of the vagina on the right side. The right ureter was exposed, and protected. The peritoneum was divided across the rectum and the back of the tumor dissected free from the rectum with great difficulty. The tumor was then excised with  $\frac{1}{2}$ " of the vaginal wall. The cervical canal was opened in doing this. The cervix was closed, and wicks were placed in the vagina and the right side of pelvis. Routine appendectomy. At the end of operation there was still a hard indurated mass the size of a quarter in the rectal wall. The peritoneum was closed so that a Kraske could be done later if necessary.

It should be noted here that no description is given of the pelvic organs which with our present knowledge of the subject would be considered most important.)

The patient re-entered the hospital on July 13, 1912, with the complaint that she had not had a natural movement since her operation. Pills and enemas were taken regularly. She had some pain when her bowels moved and an occasional dull backache.

On examination the uterus was found to be in good position and there was a small cavity to the right and behind the cervix. The right side of the vaginal vault was infiltrated with a firm nodular growth. There was no bleeding present. By rectum the nodular growth was felt to be in the anterior wall of rectum and the right side.

On July 17, 1912, in the Sims position an incision was made over the sacral region. The coccyx was removed and the lower left side of sacrum was removed to the spine of sacrum after the method of Kraske. The rectum was exposed and was dissected free. The tumor was very close to sacrum and the right wall of pelvis and after considerable dissection the tumor was freed and delivered. The rectum was divided and a tumor removed about the size of small egg. The rectum was resutured.

Five weeks later the patient was discharged relieved.

The pathological report follows: "The specimen consists of a tumor and part of the rectal wall about 10 cm. in length. Section of the mass shows a homogeneous grayish white surface with occasional small translucent areas. Microscopical examination shows glandular structures surrounded by a fairly rich cellular stroma imbedded in smooth muscle fibers. The glands are irregular in size and shape and the lining epithelium shows frequent infoldings. The cellular structure is fairly rich, contains numerous blood vessels and simulates that of normal endometrium. Examination of pieces of rectal wall

shows nothing noteworthy. The tumor is an infiltration in the rectal wall of an adenomyoma of the so called Von Recklinghausen type.

(The recognition of this type as one composed of endometrial tissue and arising from it did not occur to the Pathologist though the similarity of tissues was recognized.)

A year later after a long period of constipation, her bowels again became regular. No evidence of recurrence could be made out on careful examination.

Two years later there was no evidence of recurrence. The constriction at the point of suture of the rectum admitted two fingers.

Fourteen years later the patient had some abdominal discomfort. Her periods were normal and not profuse. There was some blood tinged mucus in the patulous cervix and the uterus was definitely enlarged and fixed in the pelvis. There was no doubt but that further recurrence had taken place and an operation was advised.

(It is possible that the origin of this lesion was in the ovary and being endometrial in character it therefore has continued to grow slowly in as much as the ovarian stimulation is still present. If the ovaries had been removed at either operation the disease would have receded and no further operation would probably have been necessary.)

CASE No. II. M. E. A. East Surgical 221230. Age 31 yrs. White. Married. No children. No abortions.

The patient entered the hospital March 14, 1918, complaining of painful menstruation. She sought relief nine years ago for dysmenorrhea and sterility and a suspension of uterus was done without result. Her family history and past history were negative. She was not constipated. Her periods were always regular and normal except for pain.

On physical examination her abdomen was negative. The perineum and vagina were normal. The cervix was normal in consistency. Just back of the cervix and apparently extending to the posterior lip there was a mass the size of one's finger of firm consistency, not tender and moving with the cervix. This could not be seen by speculum. The uterus was normal in size and in good position. The cul-de-sac and vaults were free.

On March 25th through the vagina a tumor of its wall was partly excised and a tumor of the rectum freed. The abdomen was opened and two distinct tumors found in the rectal wall. The lower one was continuous with the original piece. The upper was  $1\frac{1}{2}$  inches above the recto-vaginal peritoneal pouch in the rectal wall. There was considerable constriction of the rectum from scar tissue. The anterior rectal wall including growths was excised for 3 inches and sutured.

(Here again in 1918 no mention was made of the pelvic organs. In a case of this sort this fact is now known to be most important.)

The patient had a very normal convalescence.

The pathological report follows,—"two separate nodules each about the same size, 3 cm. in diameter, one of the surfaces is covered with a smooth red membrane like mucosa. There are three or four much smaller, irregular separate pieces. On section they all show a similar character namely—grayish white granular surfaces which show small bluish cysts about pin head size and sometimes a little larger. Microscopic examination of the larger piece shows a smooth muscle and fibrous stroma in which are tubules with a cellular stroma containing red blood cells which is similar to endometrium. These gland tubules are sometimes single and sometimes in clusters. The latter are irregular in shape and give the impression of being out-pocketings from a single chamber. One surface of the tumor is covered



with mucosa like that of the rectum. Gland tubules are found in close proximity to the mucosa. The two layers of muscle of the intestinal wall cannot be identified and the stroma more closely resembles that of the uterine wall. Diagnosis: Adenomyoma of the recto-vaginal septum.

One year later the pelvic examination was the same. There were no symptoms that could be connected with the tumor, but the patient had the same dysmenorrhea.

Six years later she had a uterine hemorrhage lasting two weeks.

Eight years later her periods normal. She had no nausea and the pain was lessening. Her bowels were in excellent condition. She had remained sterile. On examination her uterus was small, fixed, but forward. No masses could be felt. Behind the cervix was a scarred area with little points that reddened easily. No definite tumor felt. Rectal examination was the same.

(This patient had apparently been completely relieved of her symptoms by complete removal of the local lesion without regard to the uterine or ovarian findings. However, removal of three inches of the anterior rectal wall through the abdomen is a very serious procedure.)

CASE No. III.\* M. F. C. West Surgical 270513. Age 34 yrs. White. Married 11 yrs. No children. No abortions.

This patient entered the hospital on June 25, 1925, being recommended from the Tumor Clinic of the Massachusetts General Hospital with a diagnosis of adenomyoma of the recto-vaginal septum. She entered complaining of difficulty with periods for six years, consisting of pain and backache. In December 1922 the symptoms were so severe that an operation was performed when the right tube and ovary were removed and also a vaginal tumor. (The pathological diagnosis at that time was chronic salpingitis, parovarian cysts and simple cysts of the ovary.) Following the operation she had complete relief of symptoms for 3½ months and then the pain returned with menstruation. Her periods increased, lasting about a week with increasing pain. Her pain lasted for three days and was across the lower abdomen and in left side (remaining ovary.) Between the catamenia the patient was very constipated, during her period she complained of diarrhoea and felt as though there was something in the rectum that she could not pass. She had been married eleven years and no pregnancies had resulted. Her family history was negative and her past history was negative except as described above.

Abdominal examination was negative except for mid line scar. Pelvic examination showed a firm elongated cervix. The fundus was not felt and the vaults were clear. In the posterior vagina behind the cervix was a hard irregular fixed mass which did not bleed on manipulation. By rectum this was entirely anterior and extended well out laterally, more on the right. (It was felt by the House Doctor who made the examination that except for the admission diagnosis the lesion should be called Adenocarcinoma. This is a typical error in cases of this sort.)

On June 27, 1925, under ether the uterus was found to be firmly fixed. There was a small hard tumor in the region of the pouch of Douglas. A specimen was removed which showed only stratified epithelium.

On July 3 the abdomen was explored. The right ovary was absent. The left ovary was adherent in the posterior cul-de-sac. There were no macroscopic

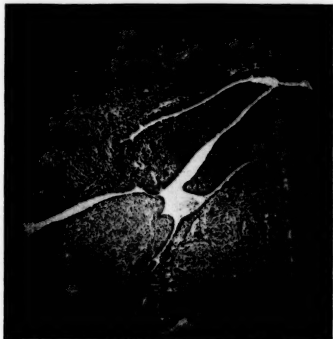
signs of the peritoneal implants described by Sampson. In the posterior cul-de-sac was a hard adherent tumor which was in the anterior wall of the rectum and the posterior wall of the vagina. The rectum was closely adherent to the uterus at this point. The remaining ovary was removed. Through the vagina another piece of the tumor was removed for diagnosis.

(Here is the modern treatment of this condition. All the ovarian tissue was removed and the endometrial tissue was allowed to atrophy as a uterus does following castration or the menopause.)

The pathological report follows:—A normal ovary and a small piece of tissue from the vaginal wall. The latter on microscopical examination showed a small gland tubule lined by a columnar epithelium and surrounded by an area of hemorrhage. The appearance suggests adenomyoma. The ovary shows a normal structure. Diagnosis Adenomyoma of the recto-vaginal septum.

The patient made a normal recovery.

This patient was followed very closely in the Tumor Clinic of the Massachusetts General Hospital and the findings at each examination were important and so they are given below.



CASE III, FIGURE I. Showing an area of endometrial-like glandular tissue in the stroma of an ovary. This slide is from an ovarian cyst removed at first operation in Case III.

October 28. Patient felt well. By rectum—the mass seemed to be about the same size, hard, firmly fixed and immovable. This might be tumor or inflammation. Patient was having hot flashes and was undoubtedly having the change of life.

January 7, 1926. Patient felt quite well. Examination showed a small mass in the posterior cul-de-sac which seemed to be adherent to the cervix, 3x3 cm. in size and somewhat tender on palpation. No further treatment was indicated at this examination.

April 3, 1926. Patient felt very well. She was gaining weight. She had hot flashes which were controlled with ovarian extract given her by her own doctor. The tumor which was posterior to cervix was the size of a ten cent piece and was covered with a good mucous membrane. By rectum, there was a tumor 2x2 cm. which was not tender and which was a great deal smaller than it was in October 1925. She had done very well. Asked to report on June 5, 1926, for examination at end of one year.

June 19, 1926. The patient's backache was better than it was before her operation but was still present when tired. Vaginal examination showed a

\*Mrs. M. C. was seen again in December, 1926, and the tumor in the recto-vaginal septum had practically disappeared and her backaches bothered her no longer.

small mass behind the cervix which on inspection looked like a puckered scar. The fundus of uterus could not be felt. By rectum the mass was felt about 2x2 cm. in size. The uterus was firmly fixed and could not be moved. However, since operation the patient's symptoms of alternating constipation and diarrhoea had disappeared. Her hot flashes were controlled by ovarian extract. The tumor mass had been reduced about 50% and the patient was symptomatically cured except for slight backache. The tumor mass was disappearing very slowly but the symptoms had gone and the patient felt perfectly well. She believed that she improved each month.

(Three months and a half showed no diminution in the size of the tumor but in six months there was definite diminution in size. The slides of this case from first operation were sent for and a re-examination made. The cyst in the right ovary was clearly an endometrial hematoma (Sampson cyst). It is therefore quite possible that the lesion in the recto-vaginal septum in this case arose, as Sampson suggests, from the extension of an ovarian cyst or tumor containing endometrium.)

#### TREATMENT

The very early lesion situated behind the cervix and movable on the rectum can be removed locally. However, in light of the very definite possibility of the disease originating in an ovary recurrence is a probability and a serious pelvic lesion may be overlooked.

For the tumor which has extended beyond possible local removal the best method of treatment is probably that outlined in Case No. III—that is, the removal of all ovarian tissue.

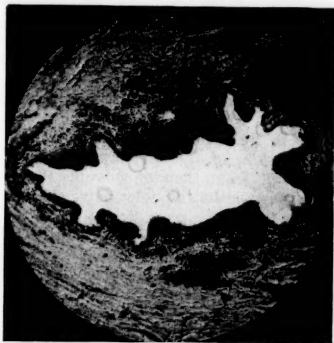
Removal of all ovarian tissue will cause an artificial menopause and this form of climacteric as well as the normal and natural menopause will cause an atrophy of the uterus and probably of all lesions of endometrial-like tissue. Thus the atrophy indicated will gradually cause a lessening of symptoms and a shrinking of the tumor mass. The shrinkage will probably become evident in from four to six months and relief will follow slowly with the subsequent retrogression. Keene<sup>8</sup>, Norris<sup>9</sup>, Graves<sup>8</sup> and Sampson<sup>4,5,6,7</sup> have all noticed this retrogression of adenomyomata following removal of all ovarian tissue. As experimental evidence of atrophy without the presence of ovarian tissue Jacobson's<sup>10</sup> experience is important. To quote directly from his article: "Five rabbits were subjected to complete oophorectomy and at the same time intra-abdominal transplantation of endometrial tissue was done. In all of the animals' growths were obtained but they were much smaller than in the uncastrated, partaking of the same atrophic changes affecting the uterus following deprivation of the ovarian principle."

So that it is apparent that there is considerable weight of evidence that endometrial tissue without the presence of the ovarian secretion will usually atrophy.

Complete oophorectomy is a simple procedure but of course carries the added insult of the artificial menopause. The tumor in Case III

atrophied in one year to about one-half its original size and the chief symptoms of diarrhoea and constipation have been eradicated. Backache, however, still persists but it does not seem to be due to the lesion in this particular case, perhaps on orthopedic examination might aid in relieving this symptom also.

Case I operated upon before the nature of the lesion was known needed two operations to remove the tumor mass, both, especially the last, of a very serious nature. For fourteen years the patient has been without recurrence of trouble, but now at the last examination shows a mass in the pelvis which can be assumed to be the growth of an original adenomyomatous process in the pelvis. Operation will probably have to be done in the very near future and perhaps with a serious result. Had the etiology



CASE III, FIGURE II. Large dilated endometrial-like gland with typical stroma about it. This slide is from the adenomyoma of the recto-vaginal septum which probably arose from the ovarian endometrial hematoma shown in the previous photomicrograph.

and pathology been known in 1912 this patient would probably be cured today.

Case II is well and has no complaints. Her pelvis is nearly normal and as far as can be judged is perfectly well. Examination revealed no suggestion of recurrence or any pelvic pathology of note. However, removal of three inches of the anterior rectal wall through the abdomen with removal of part of the vaginal wall below is a very serious procedure and one that cannot be compared with removal of all ovarian tissue.

If, however, the ovaries contain endometrial cysts of fair size and are densely adherent it might be impossible to remove all ovarian tissue and in this case the adenomyoma would continue to grow just so long as there remained any ovarian stimulation. It might conceivably be necessary to resort to one of the other types of operation described in Cases I and II.

Another form of treatment which is conceivably possible is an ovary destroying dose of Ra-

dium (intra-uterine) or of the deep X-ray. Theoretically this should cause uterine atrophy and with it atrophy of the endometrial-like tissue in the tumor of the recto-vaginal septum.

The best procedure probably is removal of all ovarian tissue for this will nearly certainly produce the atrophy necessary to reduce the size of the tumor and cause a disappearance of the symptoms.

Another form of treatment if conservation of the ovarian function is desired is removal of the tumor partly by way of the vagina and partly by resection of the bowel intra-abdominally. The ovaries must be carefully inspected and if there is any sign of endometrial-like tissue in the ovaries resection with the removal of suspicious areas in the ovary or ovaries must be done. This method can not guarantee as perfect a result, but in this way the menstrual function may be preserved. It may be necessary later to operate again and remove all the ovarian tissue.

If partial intestinal obstruction is present a successful method of treatment is described by W. P. Graves\* in his Case IV. A colostomy was performed at the same time as a supra-vaginal hysterectomy with removal of both tubes and ovaries. In five months softening and diminution in the size of the tumor was noticed and improvement from then on advanced steadily. After seven months the colostomy was allowed to close.

In cases with acute intestinal obstruction a colostomy for relief of the obstruction and later a removal of both ovaries is probably the correct method of treatment.

#### CONCLUSIONS

(1) In this paper are presented three cases of adenomyoma of the recto-vaginal septum, all treated in a different manner.

(2) Case I requiring two operations, abdominal and later resection of the rectum through a Kraske incision has not been completely cured as evidenced by the fact that the pelvis at this writing is full of probably adenomyomatous tissue after fourteen years.

(3) Case II part of the tumor being removed

by vagina and part by intra-abdominal resection of the high rectum is completely cured at the end of eight years.

(4) Case III treated by removal of ovarian tissue is symptomatically cured at the end of one year and is apparently gaining each month. The tumor mass has shrunk about one-half of its original size. The reduction in size is due to atrophy of the endometrial-like tissue just as the uterus atrophies after castration or after the menopause.

(5) Case III demonstrates that the origin of the tumor may be in an ovarian cyst as suggested by Sampson. In this case the ovary originally removed contained endometrial-like tissue.

(6) The lesion is not common but the diagnosis is not difficult if the possibility of its occurrence is kept in mind.

(7) The lesion is often confused with carcinoma of the vagina or carcinoma of the cervix.

(8) If the diagnosis is in doubt a small specimen may be removed from the tumor in the recto-vaginal septum and sent to the laboratory for diagnosis.

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## POSTOPERATIVE TREATMENT OF AMPUTATION STUMPS IN PREPARATION FOR THE EARLY APPLICATION OF THE ARTIFICIAL LIMB\*

PAUL N. JEPSON, M.D.

THE early application of an artificial limb to a green amputation stump is still a debated procedure. An attempt is made in this paper to define the principles underlying amputation, to outline the postoperative preparation of the stump for the wearing of an artificial limb, and to encourage early institution of prosthesis.

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An old rule still followed by many surgeons is to "save as much stump as possible." This often places the amputation site at or very near the joint, making that segment of the artificial limb cumbersome and awkward, since the artificial joint must of necessity take two or three inches for its construction. If the stump is extremely long the artificial leg will be longer than

the unaffected extremity. This is especially true in an amputation at or above the knee. An amputation through, or a little above, the ankle joint necessitates a clumsy thick ankle in the artificial leg.

In the foot, amputation through the tarsal bones is unsatisfactory. Since the power to extend the foot has been lost with the destruction of the lateral and peroneal ligamentary insertions, an equinus deformity of the stump results, unless arthrodesis of the os calcis and astragalus is performed at right angles to the tibia, as advocated by Lounsbery. Syme's amputation has caused more controversy than any other type. Surgeons on the whole are in favor of it, while the limb-makers almost unanimously condemn it.

It has been the policy at the Mayo Clinic to observe the rule laid down in the manual of Military Orthopedics, published by the Surgeon-General: "When the requirements necessary to conserve the safety of the patient have been met, the sole remaining consideration is to be given to securing the stump which will best meet the demands made upon it by the artificial limb."

#### PROPER LEVELS OF AMPUTATION

*Foot.*—The foot is like a tripod with a three-point bearing: the heel and the heads of the first and fifth metatarsal bones together with the second, third, and fourth metatarsal heads to some extent form the tripod so that any of the second, third and fourth toes may always be amputated without interfering with the support of the foot. There should be a plantar flap and the scar should be on the dorsal surface.

Amputation through the tarso-metatarsal region gives a fair stump, but the scar so often breaks down leaving a painful stump that this type of amputation should be resorted to only rarely. A Chopart amputation is not a good one unless it is accompanied by arthrodesis to prevent plantar flexion. As a rule reamputation will be required. Pirogoff's amputation and similar methods are unsatisfactory and should be discouraged.

Syme's amputation under ideal conditions (with a plantar flap, the blood supply intact, the nerves severed and the tibia and fibula sawed 1.5 cm. above the articular surface and squarely at right angles to the line of balance of the leg) gives a satisfactory stump, but ideal conditions are seldom encountered<sup>8</sup>. Such a stump is hard to fit with an artificial limb. The ankle of the appliance is bulky and heavy. For these and other reasons Syme's amputation should be avoided. Leading makers of artificial limbs estimate that 80 per cent of all patients with this type of amputation undergo reamputation.

*Leg.*—Within certain limits a long stump is better than a short one. A stump measuring

17.5 cm. from the lower edge of the patella (with the leg extended) to the tip end of the stump is perhaps the ideal one below the knee. When the stump is much longer it becomes necessary to make the artificial limb thick at the ankle in order to accommodate it. In long stumps the skin often has a poor circulation and healing may be slow. The ideal flap is twice as long in front as in the back<sup>10</sup>. The crest of the tibia should be beveled off and all sharp edges rounded with a rongeur or file. The fibula should be cut 4 cm. shorter than the tibia. In stumps shorter than 15 cm. the fibula should be removed entirely<sup>2</sup>. When allowed to remain, this bone usually spreads laterally and causes a prominence which is almost always painful. A stump as short as 5 cm. may prove serviceable with this technique; this fact is important to the wearer of an artificial leg because knee control is a great aid in walking. Amputation through the knee is not to be recommended because of the bulkiness of the stump.

*Thigh.*—Perhaps the most ideal amputation in this region is that in which the femur is divided through the upper part of the supracondylar ridges, and the superficial half of the patella is nailed or sutured over the cut end of the bone. This is the well known Stokes-Grritti amputation<sup>6</sup>. It is well liked both by the surgeon and by the limb-maker. Care must be taken to anchor the patella securely in place and to take off enough femur to allow room for the mechanical knee in the artificial limb. If the wound becomes infected, there is danger of the patella's becoming necrotic, and its removal may then be difficult. The best flap is one which leaves a posterior scar. The end of the stump should be covered with muscle and fascia and the skin sutured fairly snugly. A flabby stump usually causes trouble. Above the level of the site of a Stokes-Grritti amputation the rule is to save as long a stump as possible<sup>1</sup>. The shortest stump above the knee which can be used satisfactorily in the socket or bucket should measure 5 cm. from the adductor tendon in the groin to the tip of the stump.

Amputation through the hip-joint is not very satisfactory from the standpoint of prosthesis and should be performed only as a last resort. But even with this type of amputation the prosthetists have devised a fairly satisfactory artificial limb<sup>7</sup>.

*Upper extremity.*—The upper extremity presents to the surgeon and the limb-maker a very different problem from that of the lower extremity. At best an artificial arm is a poor substitute for the natural arm. It serves as a means of assisting the normal remaining hand in its function<sup>9</sup>. The stump serves only as a guide for the prosthetic appliance, and the normal arm must therefore be educated to the maximum.

Early amputation of the hand or any part of

it should be undertaken only as a life-saving measure. Occasionally one digit may be transplanted to function as a thumb, and to serve much more satisfactorily than an artificial hand.<sup>8</sup> The rule is for the surgeon to save as much of the hand as possible and, after the wounds are healed and the maximal amount of function determined, proceed accordingly. The loss of a thumb is such a great hindrance that the saving of any portion of this digit is important. The amputation of any individual finger must be left to the judgment of the surgeon. Long palmar flaps should be used and the nerves cut short and allowed to drop back.<sup>11</sup>

The following rules may be safely followed in amputations affecting the upper extremity<sup>2</sup>:

One finger without the thumb or opposing portion of the hand should never be left; the thumb and one remaining finger are serviceable; when all the fingers are amputated it is desirable to preserve the thumb and the opposing palm of the hand; the thumb without any opposing part of the hand is of no service unless prosthesis may be satisfactorily instituted; when none of the digits remain an amputation through the palm of the hand is not advisable, for the remaining part of the stump would be of no practical value and make it impossible to apply a useful artificial substitute, and amputation through the wrist does not as a rule result in a good stump. It preserves supination and pronation, but it also produces a stump that is hard to fit with an artificial arm on account of the width caused by the protrusion of the styloid process of the ulna, and because such a stump almost always becomes tender and sore<sup>3</sup>. It also necessitates making the artificial arm longer.

From a prosthetic standpoint, considering both appearance and utility, the ideal site for amputation of the forearm is between the middle and lower thirds. Amputation at higher levels detracts from the utility of the arm. The stump of the forearm must be about 10 cm. long, measured from the olecranon, to be of any service in controlling the artificial arm-socket. A 10-cm. stump measured from this point is only from 2.5 to 4 cm. long, measured from the anterior seam or fold in the cubital space of the elbow in the flexed position. A stump shorter than this keeps slipping out of the artificial arm socket<sup>2</sup>. An elbow joint is useful in keeping the artificial arm from rotating on the stump, and very useful appliances have been worn below it with satisfac-

tion. The flap may be cut so as to conserve the greatest amount of stump, but care should be taken to prevent the scar's becoming adherent to the bone and to prevent its coming directly over the end of the bone, if the stump is used to push the artificial arm forward.

Amputation at the elbow joint possesses absolutely no advantage over amputation above, but it does possess a serious prosthetic disadvantage: it displaces the mechanical joint in the artificial arm, and yet it does not permit the stump of the arm to function. Such an amputation should never be undertaken. If conditions will not permit a stump of the forearm of useful length, the amputation should be carried out 2.5 cm. above

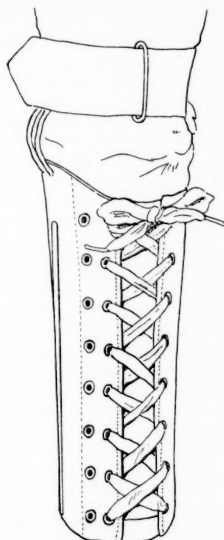


FIGURE 1. Leather reducing and protecting corset for stump below the knee.

the elbow. This will give the necessary room for the artificial elbow. Whenever it is necessary to amputate higher than 2.5 cm. above the elbow, every centimeter possible, consistent with a good flap, should be saved. Amputation of the humerus 2.5 cm. below the axilla, which will allow adduction and abduction, is somewhat helpful in controlling the artificial arm, and this amputation should be carried out in preference to disarticulation at the shoulder<sup>2</sup>. Disarticulation at the shoulder permits the use of an artificial arm, which serves mainly an esthetic purpose.

#### PREPARATION OF THE STUMP

Immediately after operation the stump should be so controlled as to prevent flexion deformity. In amputations below the knee a posterior splint

<sup>8</sup>A young man who had sustained a traumatic amputation of the left thumb and index finger and a fracture of the first phalanx of the middle finger, together with lacerations of the skin of the third finger, came to the hospital as an emergency case. The second and third phalanges of the middle finger were attached by a strip of skin on the medial side, and the blood and nerve supply being intact, the distal two phalanges were transplanted to the base of the freshened end of the first metacarpal bone. This transplant was sutured in place with chromic catgut and the skin closed over. Subsequently it was necessary to apply Thiersch skin-grafts. The transplanted finger eventually became solid, and after considerable physiotherapy the patient was able to use the thumb in carrying on his regular occupation as a farmer. Later on he was able to pick up a small shot, milk cows, and do almost everything that he did formerly.<sup>12</sup>



may be bent to protect the end of the stump, or a light cast may be applied. In amputations above the knee the patient should be placed on his back in bed, a towel thrown over the stump and sandbags so applied as to weigh down the towel on either side of the stump. As a rule no

tremitry a so-called leather "reducing corset" may be worn (Figure 1); it should be laced up tightly and held onto the stump by a suspender arrangement. This reducing corset is oftentimes worn until the artificial leg can be attached. However, the stump, under ordinary treatment, will continue to diminish in size and change in shape for almost a year following the amputation. Shrinkage of some stumps can often be increased materially by the wearing of a temporary peg-leg. The socket of this temporary prosthetic appliance is made of plaster-of-Paris or leather, and is changed or tightened as the stump shrinks (Figure 2). The remainder of the apparatus consists of a wooden or steel peg. These temporary legs should not be applied earlier than a month after operation, whereas the simple reducing corset may be applied as soon as the patient is allowed out of bed, because it protects as well as reduces (Figure 3).

In an amputation below the knee it may take as long as seven or eight months to prepare the stump so as to enable the patient to wear the ordinary so-called single-socket leg. This period of preparation is reduced for amputations of the thigh. The use of the temporary peg-leg keeps the muscles active, and, as a rule, promotes healing and teaches the patient the art of balancing himself. In many cases, however, the opposite results: the stump may break out and the whole operation result disastrously.

To be entirely efficient (1) the artificial leg must properly support the body weight from the ground when the patient is standing and walking; (2) it must enable him to simulate the natural movements as nearly as possible, and it must have a natural appearance, and (3) the leg must be so constructed that when the patient places his weight upon it the knee will remain stable and not fly out.

#### PROSTHESIS

There are only two types of amputation that tolerate "end-bearing" (bearing the entire body weight on the end of the stump): Syme's am-

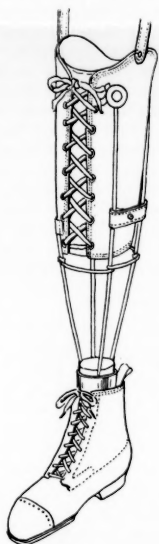


FIGURE 2. Test leg with foot for amputation below the knee.

fixation is necessary in the arm. The stump should be kept tightly bandaged. About a week after operation, light massage of the stump should be carried out and, as quickly as the incision is healed, massage and active exercise may be undertaken. Contrast baths are excellent, and are all that is necessary, as a rule, in the postoperative care of the upper extremity.

At this stage in amputations of the lower ex-

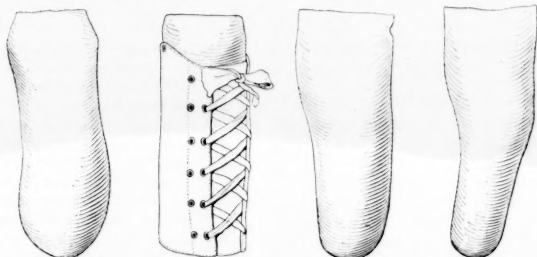


FIGURE 3. Showing the reduction in size and shape of stump as a result of wearing a reducing corset.

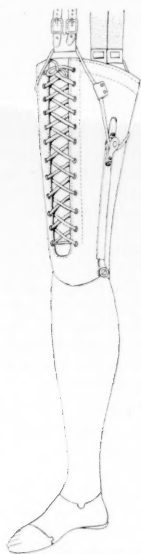


FIGURE 4. Type of artificial limb for the stump from the Stokes-Gritti or knee-bearing amputation.

putation, when performed under ideal conditions, and the Stokes-Gritti amputation above the knee (Figure 4). All other end-bearing stumps are more or less unsatisfactory. In most cases the greater part of the weight is borne on



FIGURE 5. Type of artificial limb for the stump from an amputation above the knee.

the bony prominences of the joint next above the stump. After an amputation below the knee the bearing comes on the tibial condyles and just beneath the patella. In amputations above the knee it comes mostly on the ischial tuberosity but partly on the lateral surfaces of the stump.

The thigh socket should fit the stump accurately (Figure 5). A ledge sufficiently wide and rounded to take the weight comfortably should be left at the ischial tuberosity. The socket should be cut down so as not to chafe or cause undue pressure on the perineum, and shaped to fit the greater trochanter accurately. The shaping of this thigh socket requires the highest type of skilled workmanship because on this part of

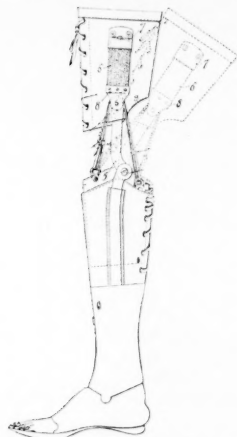


FIGURE 6. Type of artificial limb for stump from amputation below the knee.

the artificial leg depends the comfort of the patient. The material used is usually kiln-dried willow, covered with drumhead rawhide, on account of its lightness, durability and pliancy. Materials such as fiber, duraluminum and basswood have been used with varied success.

The knee joint of the artificial leg made for a stump above the knee should function as naturally as possible. The use of the so-called plunger causes a snapping, quick-moving knee that is at once noticeable. The foot and ankle should give the natural anteroposterior motions of a normal foot, but not lateral motion because this would lessen the stability of the appliance.

For a stump below the knee there are two general types of artificial appliance. One is a so-called single-socket leg so made that the friction caused by walking comes between the stump and the socket. The device is usually uncomfortable, especially in hot weather. The other type is the so-called double-socket leg (Figure 6). In this the friction comes between

an inner and an outer socket instead of between the stump and the socket. This is accomplished by suspending the inner bucket or socket from the thigh of the artificial leg by means of strips of elastic. These give a springy, natural gait and therefore this type of leg is, as a rule, far more comfortable. Certain manufacturers make this inner socket adjustable so that the patient can begin to wear his prosthetic appliance much earlier than other types of limb and have the advantage of an early start in learning to balance himself. It fits the stump better for continuous wear and function and does not give the muscles an opportunity to atrophy.

After a knee-bearing or a Stokes-Gritti amputation the prosthetic appliance is usually made of leather around the thigh (Figure 4) and the remainder like the leg described for a stump above the knee. In this type the weight is borne almost entirely on the end of the stump. Following Syme's amputation the sock-

artificial arm for a stump above the elbow is worn more for appearance' sake than for its practical use.

#### SUMMARY

The points of election in amputating and the postoperative care have been outlined. Attention is called to the fact that, in amputating, the main consideration is not to save all the tissue possible but to provide a stump to which a useful prosthetic appliance can be readily attached. The general types of prosthetic appliance and their advantages have been briefly described. The desirability of an early return of the amputated member to function has been emphasized.

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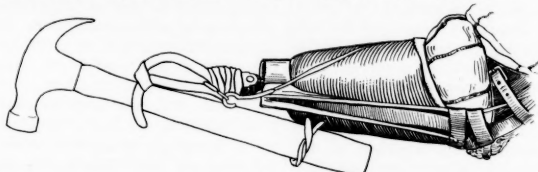


FIGURE 7. Method of using a hook, which may be inserted into the lower end of the arm.

et is usually made of wood or leather. The joints may be applied either laterally or antero-posteriorly. This type of amputation necessitates a rather bulky ankle joint. The bearing is almost entirely on the end of the stump. In most cases walking causes sore or painful stumps. Amputation of the toe or toes calls for a special apparatus. The artificial toe is fastened to a plate and the apparatus is worn inside the shoe.

After amputation below the elbow leaving a stump more than 5 cm. long, a very serviceable artificial arm can be constructed (Figure 7). Many kinds of tools can be placed in the wrist piece and used to advantage. The artificial hand, as a rule, is for cosmetic purposes. An

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## SPECIFIC PREVENTIVE MEASURES IN DIPHTHERIA, SCARLET FEVER AND MEASLES\*

### A Review of Our Present Knowledge

BY JAMES H. TOWNSEND, M.D.

#### DIPHTHERIA

CERTAIN aspects of the subject matter of this paper are thoroughly well established and familiar; other phases are still in the experimental stage. Because of their rather close analogy to some of the newer methods in other diseases, the more familiar procedures will first be discussed.

\*Read before the Merrimack County Medical Society, Concord, N. H., January 12, 1927.

In diphtheria there are at our disposal methods which, if carried to their utmost possibilities, would completely eradicate the disease. First, there is the Schick test, by which may be determined with a fair degree of accuracy whether a person, if exposed, is capable of con-

tracting diphtheria. Absence of inflammatory reaction after the intracutaneous injection of 1/50 M.L.D. demonstrates that the body has a sufficient antitoxin content to protect itself against attacks by the Klebs-Löffler bacillus. Under certain conditions this information is of great value, under others it is unnecessary. For instance, if a case of diphtheria occurs in an institution or a family, it is very necessary to determine at once what persons are susceptible in order to give them immediate protection. Likewise in persons past the age of two years, when permanent immunization is contemplated, a certain number may be spared inoculations if a Schick test shows that they are already immune. Under two years the percentage of susceptible persons is so high that it is a waste of time and effort to do a Schick test—one simply assumes that it will be positive.

This test is not altogether free from pit-falls. There are a good many pseudo-reactions due to slight degrees of protein sensitiveness, and although these may be largely eliminated by using a control injection of heated toxin, a certain number of tests are difficult to interpret. The safer way is to treat these as positive.

**Passive Immunization.** Immediate immunity in persons who have been exposed may be secured by an injection of 1,000 units of antitoxin. Such immunity has the disadvantage of being of short duration, lasting probably not longer than six weeks. It also carries with it a certain risk of foreign protein reaction. Any danger of severe shock can be avoided by a preliminary skin test, but delayed reactions, such as urticaria, will occur in a certain number of cases after about a week's time. With the concentrated antitoxin now produced, however, the number of instances of serum sickness is small.

**Active Immunization.** The more far-reaching method is to produce an active immunity which is more or less permanent in character. This **may require time to develop**—sometimes several months—but since a transient protection is available in cases where prompt action is advisable, this has no particular disadvantage.

Pure diphtheria toxin is too irritating for use in human beings. The toxin is, therefore, partially neutralized with antitoxin and this toxin-antitoxin mixture is the substance now in general use for permanent immunization. A series of three subcutaneous injections of 1 c.c. each are given at intervals of one week. The reaction is slight and almost entirely local. In a series of several hundred such inoculations at St. Paul's School, Concord, N. H., we have never had a boy confined to the infirmary. It is now common practice in a great many schools, public and private, to inoculate any susceptible children whose parents will consent, and at St. Paul's we have had no difficulty in carrying out the rule that *all* the boys, on entrance to the

School, shall be inoculated against diphtheria, if not already immune.

While school age seems a natural time for this immunization to be carried out, yet it is in the younger children of pre-school age that diphtheria is more apt to assume the dangerous laryngeal form. Therefore, if diphtheria is to be stamped out—and it can be—the work must be begun earlier. A very large series of tests by Park, Zingher and others have shown that at the end of about six months most infants lose what immunity they may have received from their mothers, and that about 95% of children at this age are susceptible. From then on, there is a gradually decreasing percentage of susceptibility up to fifteen years, at which age, about 50% of public school children in large cities are immune. In country children, however, and in children who, like the majority of the boys at St. Paul's, have led protected lives, the high rate of susceptibility is maintained. We find almost 90% of our new boys show a positive test. Toxin-antitoxin inoculations, therefore, should be a routine procedure in every infant between the ages of six months and one year. It is the duty of the pediatricians, the Baby Hygiene Stations, and other health agencies to educate the public up to the necessity of this procedure.

In a certain number of cases permanent immunization will not be accomplished by one series of inoculations. After four to six months, the Schick test should be given, and if positive, the inoculations should be repeated. It has been our experience that about 10% of the older boys require a second course. Probably in infants the percentage would not be as large. I have yet to see anyone who was still positive after a second series of injections. Once negative, the child remains so for a long period, perhaps permanently. A repetition of the test at school age does no harm, but will probably be found negative.

A theoretical objection has been raised to the widespread use of toxin-antitoxin because it contains a small amount of horse serum. Practically, however, there seems to be no basis for this scruple. The amount of horse serum given—about 1/5000 c.c.—is so small that it neither causes protein reaction nor sensitizes the patient to the protein. Bauer and Wilmer<sup>1</sup> have shown, in a large series of children tested six months after immunization, that sensitivity to horse protein is not produced by the inoculations; furthermore, they have inoculated a considerable series of children known to be sensitive to horse protein without reaction. As a matter of fact, it is especially important for those easily affected by horse protein to be immunized because, should they acquire diphtheria, it might be difficult to give them antitoxin.

Because of this theoretical objection, attempts have been made to produce an antigen which

does not contain horse serum. Two such substances are worthy of mention. One, known as toxoid, is prepared by treating diphtheria toxin with formaldehyde, the other by treating the toxin with sodium ricinoleate. Both are non-toxic and may be suitable for use, but not enough experimental work has been done on the degree of immunity produced, and the dosage required, to justify their substitution for toxin-antitoxin as yet.

#### SCARLET FEVER

Within the last two or three years there have been acquired for the prevention of scarlet fever a series of procedures quite analogous to those for diphtheria, but the methods are somewhat different in their details, and have been less thoroughly worked out.

**Dick Test.** Like the Shick test in diphtheria, a positive test indicates susceptibility to scarlet fever. The reaction is quicker, reaching its height in 20 to 24 hours, instead of four days as in the Shick test, and a control test is not necessary because the toxin can be obtained in relatively pure form. Furthermore, it is more stable than diphtheria toxin and can be put up already diluted for use. One-tenth of 1 c.c. is injected intracutaneously, and any redness more than 1 cm. in diam. at the end of twenty-four hours is considered positive. The material for the test is put up commercially only by Squibb & Co.

Just how accurate a criterion it may be considered cannot be finally stated at this time. Cases of scarlet fever after a negative test have been reported, but these are rare, and it seems fair to consider a person safe who shows a negative test properly done, with fresh material. Persons who have had what was apparently a typical case of scarlet fever in the past are sometimes found to have a positive reaction, and one is sometimes in the dilemma of disregarding either the history or the test. Second attacks of scarlet fever have been reported in just such persons. The difficulty may be due to different strains of scarlet fever streptococcus. Each individual case requires separate consideration.

**Passive Immunization.** Although scarlet fever streptococcus antitoxin is an efficient agent for treating the disease, it cannot yet be recommended for the immunization of susceptible persons who have been exposed, because of its tendency to cause rather severe serum sickness some days later. Just why it should produce more reaction than diphtheria or tetanus antitoxin has not been fully explained, but there seems to be no question that persons are sometimes sicker with the protein reaction than they probably would have been with scarlet fever. I have never known of any deaths from its use, and it will probably protect against scarlet fever for a period of about three to four weeks, yet at

the present time it seems to be the part of wisdom not to give prophylactic doses of scarlet fever antitoxin.

**Active Immunization.** The situation here is more encouraging. There seems to be no doubt that persons can be made actively immune to scarlet fever in a relatively short time—perhaps one or two weeks. The method most widely used for this treatment has been increasing doses of straight scarlet fever streptococcus toxin—such as is put out by Squibb & Co. As to the dosage and number of injections to be given there has been much difference of opinion, and even now there is no uniformity. The Scarlet Fever Committee, reflecting chiefly the work of the Dicks, recommend five injections of 500, 1500, 5000, 15,000, 20,000 skin test doses at weekly intervals. These are the doses put up in the Squibb package. The practical difficulty of using such a long series of inoculations on a large scale is apparent at once. Young and Orr<sup>2</sup> of the Michigan State Department of Health claim just as good results with three injections of 500, 5,000, and 30,000 skin test doses with a two week interval between them.

Dr. Thomas Dudley has kindly consented to my using a series of his cases which were given the toxin two months ago because of the appearance of scarlet fever in an institution, and which were retested the other day. This includes only those who were positive at a previous test. Out of seventeen children, sixteen or 94 per cent. were negative, and one, or 6 per cent., was positive. These children have remained well. One other child, who was positive, developed scarlet fever after the second inoculation. The other children in the institution were negative, and none developed scarlet fever. After the inoculations were completed, three new children were brought in to the institution. One developed scarlet fever in a week. The others were given another kind of inoculation and are still well.

In carrying out a series of these inoculations with the Squibb material on a group of fifty boys, this fall, I encountered somewhat more pronounced reactions than I had anticipated. None of them were serious in any way, but after the first, fourth, and fifth injections, about 20% of the boys suffered from headache, fever, and malaise, so that they had to spend twenty-four hours in bed. After the last two injections, vomiting was also frequent. I did not encounter any skin rashes, although these have been frequently reported, and sometimes cause confusion during a scarlet fever outbreak.

While these reactions were not dangerous, they constitute a serious drawback to the use of scarlet fever streptococcus toxin on a large scale, and cause one to look around for some other agent. This is at present available in the shape of toxin treated with sodium ricinoleate, similar to the diphtheria toxin so treated. It is not quite



comparable because the scarlet fever material contains a certain number of killed bacteria as well as toxin, and is designed to produce an antibacterial, as well as an antitoxic, immunity. Larson, Huenekins and Colby<sup>3</sup> report a large series of cases treated with a single dose of this material containing about 3,000 skin test doses of treated toxin in which they have obtained about 75% immunities at the end of one week and over 90% in three weeks. Moreover, the reaction is very slight and almost entirely local. With the immunity coming on so quickly, it is therefore suitable for use in suppressing epidemics in families and institutions, although, of course, a few cases will occur before the immunity comes on.

The material is put out commercially now by Eli Lilly Company, under the name of Ricinoleated Scarlatinal Streptococcus Antigen. For adults two doses of one-half and one c.c. are recommended, and for children under twelve one dose of one c.c. As a matter of fact, I have used two doses of one c.c. on children. The reactions were very slight as compared with the reaction to the untreated toxin.

I have recently had occasion to use the Eli Lilly Company preparation in a series of about twenty-five persons in a community where scarlet fever had appeared, and where it was important to keep it from spreading. Most of these subjects had not been exposed, so that one cannot say whether or not they were protected, but a re-test of eighteen, four weeks after the inoculations, showed 72% immune. In the family where the disease occurred, however, it does not seem to have given adequate protection. One person, an adult, developed scarlet fever a week after the second dose, and a second person, a child, developed scarlet fever a month after a second dose. The first case should not be considered a failure—the time was too short. The second case certainly was a failure, probably because of inadequate dosage.

It seems to me an open question which material should be used. If the ricinoleated antigen is used, I think a larger dose—say  $1\frac{1}{2}$  c.c.—should be given one week following the course usually recommended. Neither is perfect, but they are the best we have at present, and do promise considerable protection.

The question most under discussion about the scarlet fever inoculations is the duration of the immunity produced, and this no one can answer as yet. Figures of eighteen months to two years have been mentioned, but the method has been in use such a short time that no one can really say. If the immunity is as short lived as this, it certainly constitutes a serious drawback to their routine use on the population at large, but we may find that the immunity lasts much longer. Even with a two-year duration, their use in institutions is to be recommended.

#### MEASLES

Ruth Tunnicliff<sup>4</sup> of Chicago has established, with a good deal of probability, that measles is caused by a diplococcus showing a green tinge on culture which can be isolated from the blood as well as the nose and throat during the early stages of the disease. She has also produced the disease in rabbits, using washings from the nose and throat of measles patients, as well as cultures of the diplococcus. Moreover, a skin test roughly analogous to the Shick test, which she has used on rabbits, but only very slightly as yet on human beings, has been described by her.

Passive immunization with human convalescent blood or serum has been employed to a considerable extent in institutions where measles spreads with rapidity. A number of experimenters have reported a high percentage of protection of exposed children inoculated soon after exposure. In our experience<sup>5</sup> at the School, 10 c.c. of whole blood did not prevent the spread of the disease, but greatly modified its course and prevented complications if given eight days before the rash appeared. Perhaps this is the best thing it could do because the immunity so produced is lasting and the disease is very mild, whereas the immunity given by the serum alone is short lived.

Tunnicliff<sup>6</sup> has recently described the use of immune goat serum in a similar way. She reports a series of 94 persons exposed to measles who had never had this malady. Of 33 who were given 5 c.c. of goat serum on the 1st, 2nd or 3rd day after exposure, only one developed the disease; of 9 who were injected on the 4th day, 5 developed it; of 18 injected after the 4th day, all got it; and of 42 not injected at all, all 42 developed it.

This is certainly encouraging, and bids fair to be of great service in institutions where the mortality is apt to be high. The difficulty about human convalescent serum is that it could never be produced commercially, while the goat serum could be.

Little or nothing has yet been reported on active immunization to measles. Many experimenters are doubtless working on it at present, but it has not yet reached a practical stage.

**Summary:** (1) Immunization of all infants to diphtheria with toxin-antitoxin during the second six months of life is strongly recommended.

(2) Passive immunization with antitoxin of scarlet fever contacts is not at present to be recommended because of the relatively severe serum reactions which sometimes occur.

Active immunization to scarlet fever with either pure toxin or ricinoleated antigen is recommended to be used in families and in institutions where the disease has appeared. As a routine procedure it also has a place in institutions.

but it is not yet ready for general use until we have more knowledge of the duration of the immunity.

(3) Passive immunization to measles with convalescent human serum, or immune goat serum, is a valuable and practical procedure in families and institutions. Active immunization to measles has yet to be developed.

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## A UTERINE INDEX OF DEVELOPMENT

### The Definition of a New Diagnostic Sign, Together With an Historical Note on the Uterine Sound and the Description of a New Instrument, the Hysterometer

BY SAMUEL R. MEAKER, M.D.

ON April 19, 1843, Sir James Y. Simpson presented before the Medico-Chirurgical Society of Edinburgh a paper entitled "Memoir on the Uterine Sound." Thirty-eight years later his nephew, Alexander Russell Simpson, referring to this contribution, said: "The introduction in practice of the uterine sound gives the clearest date for the birth of modern gynaecology."

This statement cannot be counted an exaggeration, for the introduction of the sound led immediately to two developments. The first of these was an enormous interest in the position of the uterus and in those deviations from a theoretical normal which might be regarded as displacements. The second was the idea of invading the uterine cavity for the diagnosis and local treatment of supposed endometrial disease. While in both these matters the beliefs of fifty years ago were almost entirely misconceived, nevertheless the practices based upon those beliefs were in fact the very beginnings of specialized gynaecology.

Simpson taught that the sound had both diagnostic and therapeutic uses. Diagnostically it was mainly employed to lift and steady the uterus for bimanual examination; to fix or to move the uterus in demonstrating the degree of attachment between that organ and other pelvic masses; to determine the location, direction, and length of the uterine cavity, as well as the caliber of the os internum; and to afford information about the condition of the uterine lining. Therapeutically the sound was used as a repositior for displacements, as an applicator in medicating the endometrium, and as a dilator in so-called obstructive dysmenorrhoea.

For many years the sound enjoyed a wide popularity, being used by some men as a routine part of every pelvic examination. It then fell gradually into disuse, partly because greater skill in bimanual examination made the instrument superfluous in the majority of cases, and partly because certain dangers of indiscriminate sounding became manifest.

These dangers, trauma to the uterus and infection, are negligible so long as proper precautions are observed. All manipulation must

be gentle; in fact, force is as unnecessary as it is undesirable, for the sound will almost fall in of its own weight if it is rightly directed. Scrupulous asepsis is required, much more so than in the usual vaginal examinations. The sound should not be passed in the presence of acute endoervicitis or of any active adnexal inflammation. The existence of a pregnancy must, of course, be ruled out. I do not know how often I have used the uterine sound, but I have passed an essentially similar instrument, the cannula of the Rubin apparatus, more than seven hundred times, always observing these precautions, and have never seen any untoward result.

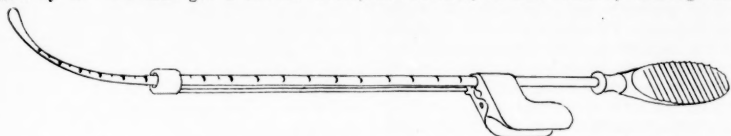
The sound deserves a wider use in diagnosis than is the rule to-day, for in certain cases it affords information of unique value. There are occasional pelvic masses, for example, in which an accurate preoperative diagnosis can be made only by ascertaining the direction and length of the uterine cavity.

We are now much interested in the size of the uterus, with special reference to underdevelopment of the pelvic organs. Pelvic hypoplasia is directly of importance in dysmenorrhoea and sterility, and indirectly of importance in many other conditions inasmuch as it is an evidence of endocrine derangement. *Infantilism*, the extreme degree of hypoplasia, is very rare. Common enough, however, is *juvenility*, an arrest of development at the prepubertal stage. The term infantile is often applied, but incorrectly, to organs showing this lesser degree of underdevelopment.

There are well-defined anatomic stigmata of uterine hypoplasia. The histological picture is striking: the proportion of connective tissue to muscle is much higher than in the normal adult organ. Grossly we note the long, conical, ante-flexed cervix with short anterior attachments; the pin-hole os; and the corpus uteri either in the axis of the vagina or ante-flexed. In size the whole organ is likely to be more or less below normal, though often not conspicuously so. The most significant stigma is, however, the relative length of the cervix and relative short-

ness of the uterine body. We are considering, of course, proportions which are due to developmental and not to hypertrophic conditions.

So important is disproportion of this sort as evidence of hypoplasia that the ratio of uterine body to cervix may, in effect, be regarded as an index of the degree of development of the organ. In the truly infantile state the ratio of the length of the supracervical uterine cavity to the length of the cervical canal is 1:2, while in the fully developed adult organ it is 2:1. Turning these ratios into fractional form, the infantile condition would be expressed as  $\frac{1}{2}$ , or .5, and the adult normal as  $\frac{2}{1}$ , or 2., while the various intermediate grades of hypoplasia would fall between these figures. Since it is convenient to have perfection represented by unity, the whole series of figures may be divided by 2. We thus get a *uterine index*,



ranging from .25 to 1., and expressing every degree of development from complete infantilism to the adult normal. This uterine index in any given case is calculated according to the formula  $\frac{1}{2} \left\{ \frac{u-c}{c} \right\}$ ,  $u$  being the length of the entire utero-cervical cavity and  $c$  the length of the cervical canal.

The uterine index represents, not the actual size of the organ, but the degree of its structural differentiation, which is our most reliable gauge of functional capacity. By the few observations already made it has become very evident that size and structural differentiation do not necessarily progress *pari passu*. For example, in two cases recently seen the uteri were above three inches in length and showed only moderate stigmata in the way of ante-flexed conical cervixes. Certainly no one would have been impressed by evidences of underdevelopment in the ordinary examination of these organs. Nevertheless the uterine indices proved to be .27 and .3. In other words these uteri, while large, were scarcely differentiated beyond the truly infantile stage. They might be compared to tadpoles which had grown to the size of frogs, but remained tadpoles. Per contra it is, I suppose, possible for a small uterus to be perfectly proportioned.

Information of this sort is clearly of the highest importance, for marked developmental arrests in the uterus are almost certain to be associated with corresponding imperfections in ovarian development, and hence with defective ovulation and sterility. It may be that after further study we shall be able to define, in terms of the uterine index, a threshold below which ovulation is not to be expected.

For the accurate taking of uterine measurements I have devised an instrument, illustrated herewith, to which the name *hysterometer* has been given. It consists of two members: (1) a uterine sound somewhat modified from the usual pattern, and (2) a sliding marker which fits over and moves upon the shaft of the sound. The two members are separable. The sound may be used by itself in the ordinary way, and the marker may be attached to any uterine sound.

The sound lacks the knob which is placed  $2\frac{1}{2}$  inches from the tip of Simpson's instrument. Its tip is bulbous at present, but may later be patterned after the bougie à boule for the better locating of the os internum. The shaft is graduated in centimeters from 2 to 20, and within the range of 2 to 10 the half-centimeters also are marked, so that ordinary readings may be

estimated at a glance with less than a millimeter of error.

The sliding marker has three component parts, solidly united. A small ring encircles the shaft of the sound; after the sound has been introduced this ring is moved up against the os externum. A spring-clip clamps the whole member to the shaft of the sound when the ring is in position, so that, as the sound is withdrawn, the marker remains fixed. A semiflexible rod 11 centimeters long connects ring and spring-clip, allowing the clip to be manipulated with ease while the ring is in the depths of the vagina.

### LIFE EXPECTANCY

THERE is an interesting factor about birthdays that should be considered. Most of us would like to know just how long we are going to live, and as our birthday figures get larger we become more concerned with the question. Well, the insurance companies have answered that for us. One table runs something like this:

At 10 you have about 85 chances out of 10,000 of living to be 90.

At 30 you have 99 chances out of 10,000 of living to be 90.

At 50 you have about 121 chances out of 10,000 of living to be 90.

At 70 you have about 214 chances out of 10,000 of living to be 90.

At 89 you have about 6,041 chances out of 10,000 of living to be 90.

From this table you may gather that the older you get the better your chances of living to a fine, old age.—*Bulletin Chicago Department of Health.*

**Case Records  
of the  
Massachusetts General Hospital**

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN  
WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY R. C. CABOT, M.D.

F. M. PAINTER, A.B., ASSISTANT EDITOR

**CASE 13151**

**A PATIENT DELIRIOUS FOR TWO  
WEEKS IN HIS SIXTY-SIXTH YEAR**

**MEDICAL DEPARTMENT**

An American of sixty-six was carried into the Emergency Ward December 22 delirious. What information was obtainable was given by his wife, who was too distressed to be able to give a complete history.

He had long been a fairly heavy drinker of alcohol. His wife had one miscarriage after the birth of their first child. Three children were living and well.

He was perfectly well until two years and two months before admission. At that time he had a "nervous breakdown" lasting a week. He had done no work since that time. His wife could give no subjective symptoms. For two years he had had increasing dyspnea, and weakness, cough and palpitation. For two months he had been somewhat irrational and for two weeks had been delirious and unmanageable. For a month his legs and ankles had been swollen. For two weeks he had coughed up blood flecked sputum in teaspoonful amounts, rarely pure red sputum. For two weeks he had been on a sofa.

Examination showed a thin, senile man with wasted skin and muscles, talking loudly and irrationally. The skin and mucous membranes were of poor color. The skin showed senile pigmentation and keratosis. The teeth were false. The mouth showed reddish thick mucus. The chest was small, expansion poor. There was dullness with harsh bronchovesicular breathing at the right apex. Throughout both lungs were squeaks and musical râles. (Another examiner found impaired resonance and moist crackling râles at the right base; no bronchial breathing. Examination was difficult on account of delirium.) The apex impulse of the heart was felt in the fifth interspace 12 centimeters from the midline, 4 centimeters outside the midclavicular line. The percussion measurements were: left border 13.5 centimeters, right border 2 centimeters, supra cardiac dullness 4.5 centimeters. There was a soft musical systolic murmur at the apex. The aortic second sound and the pulmonary second sound were both accentuated. The artery walls were markedly palpable and tor-

tuous. The blood pressure was 158/80. The abdomen showed voluntary tenseness. There was some fluid. The liver edge was felt two fingerbreadths below the umbilicus. There was edema of the genitals and marked edema of the lower legs. There was sacral decubitus with ulcer.

The urine is not recorded. Blood examination showed 25,400 to 20,200 leucocytes, 88 per cent. polynuclears, hemoglobin 75 per cent., reds and platelets normal. Stool negative.

The temperature was 100° to 101.6°, the pulse 95 to 112, the respiration 36 to 50.

The patient continued delirious and looked very toxic. The morning after admission he died.

**DISCUSSION**

BY RICHARD C. CABOT, M.D.

**NOTES ON THE HISTORY**

1. Of course at sixty-four nobody ever has a nervous breakdown.

2. "Dyspnea, weakness, cough and palpitation" are the most definite things we have. All the symptoms might be due to arteriosclerosis affecting the heart, kidney and brain. I do not think I would hazard any further guesses without the physical examination.

**NOTES ON THE PHYSICAL EXAMINATION**

We can easily imagine that no one could make a proper examination under these conditions.

It looks like a very considerably enlarged heart, especially as he is said to have a small chest.

**DIFFERENTIAL DIAGNOSIS**

It seems to me we have to conceive two elements here: (1) the signs of cerebral arteriosclerosis which there seems every reason to suppose he had for the long period of two years and two months, and (2) the terminal infection.

What has arteriosclerosis done to him? It certainly seems to me to have caused or accompanied a hypertrophied and dilated heart and hypertension. Although his diastolic pressure is not high on the day of death, there is every reason to suppose it was higher at some previous time, since his systolic is still high. He has evidence of chronic passive congestion in the legs, liver, lungs. Certainly his hypertension and his arteriosclerosis have been the underlying causes of these symptoms. Then we have the brain symptoms, especially the delirium. What can we say about those? They have been going on for two months, therefore they are not at all likely to be due to meningitis. I have never known a meningitis at his age to last so long. On the other hand they can perfectly well be due to anoxemia with arteriosclerosis,

with areas of softening or without them. I think that is the most natural explanation. I will commit myself that that is what it was, that he did not have meningitis. There are none of the confirmatory signs of meningitis, like stiff neck or Kernig. They did not tap the spinal cord, so that they evidently did not think seriously of meningitis.

What did he have as terminal infection? Two examiners of his lungs differ very much, but we know he had fever, leucocytosis, cough, and bloody sputum. Pneumonia seems to me the best guess as to the terminal infection. Bedsores may have been the cause of a septicemia, and may be the only discoverable infection at the time of death. Between that and pneumonia I cannot decide. He may well have had both.

I think that Dr. Richardson will make a diagnosis of arteriosclerosis, general, with a hypertrophied and dilated heart; that arteriosclerosis will show in the brain and very possibly go with areas of necrosis and softening. Those ought to be small, because he has had no focal symptoms. The lungs, as I said, may show bronchopneumonia, and there may be a blood infection from his bedsores. The rest of the body ought to show chronic passive congestion and nothing else.

A PHYSICIAN: Was there any paralysis?

DR. CABOT: They certainly did not mention it, and they are bound to mention it if it is there. I assume that there was no paralysis.

#### CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Arteriosclerotic heart disease.  
Congestive failure.  
Lobar pneumonia.

#### DR. RICHARD C. CABOT'S DIAGNOSIS

Arteriosclerosis, general and cerebral.  
Hypertrophy and dilatation of the heart.  
Chronic passive congestion.  
Terminal infection. (Bronchopneumonia? Septicemia?)

#### ANATOMIC DIAGNOSES

##### 1. Primary fatal lesions.

Arteriosclerosis.  
Arteriosclerosis of the vessels of Willis.

##### 2. Secondary or terminal lesions.

Wet brain.  
Hypertrophy and dilatation of the heart.  
Slight chronic adhesive pericarditis.  
Chronic passive congestion, general.  
Focal pneumonia of the right lung.  
Slight hydrothorax.  
Hydropericardium.  
Ascites, slight.  
Anasarca.  
Decubitus.

##### 3. Historical landmarks.

Chronic pleuritis.  
Meckel's diverticulum.

DR. RICHARDSON: The anatomical conditions in this case were clear. He was poorly nourished. Examination of the head showed well marked fibrous sclerosis of the vessels of Willis, but no areas of cerebral softening were found. The middle ears, sinuses and pineal and pituitary glands were negative. The brain weighed 1215 grams. The tissue was wet, but otherwise negative.

The abdomen showed slight distension. The wall was negative. The lower extremities pitted and were swollen. In the region of the left heel there was a purplish area, and one on the sole of the foot. The right extremity was a little larger than the left. In the sacral region there was a sloughing area, decubitus.

The peritoneal cavity contained 300 cubic centimeters of thin pale clear fluid,—beginning ascites. The gastro-intestinal tract was negative, except that it showed more or less well-marked chronic passive congestion. The mesenteric and retroperitoneal glands were negative. The liver was four centimeters below the costal border. The diaphragm was at the sixth rib on the right, at the seventh on the left. That is about two ribs' width down.

The pleural cavities were largely obliterated by old adhesions. These adhesions were wet and in places surrounded collections of thin pale clear fluid. That is what may happen in chronic passive congestion; if there are adhesions occupying the cavity they become edematous and surround collections of fluid in the meshwork spaces.

The trachea, bronchi and bronchial glands were negative. The apices of the lungs were negative, as was the tissue generally, except that there was some chronic passive congestion, and in the region of the lower lobe of the right lung focal areas of pneumonia, one of which showed a little purulent softening.

The pericardium contained 150 cubic centimeters or more of clear fluid, and there was a band of old adhesions from the lower part of the left ventricle to the parietal pericardium: slight chronic adhesive pericarditis.

DR. CABOT: There was nothing in the history to indicate it.

DR. RICHARDSON: The heart weighed 620 grams. That is marked hypertrophy. The right ventricle wall measured three millimeters, the left thirteen. The cavities on the left were slightly dilated, on the right moderately. The dilatation goes fairly well with the fluids and passive congestion mentioned. The valve measurements were as follows: mitral 11.5 centimeters, aortic 7.5 centimeters, tricuspid 14 centimeters, pulmonary 9 centimeters. The valves were negative except that



the circumferences of the pulmonary, mitral, and tricuspid were moderately increased.

The coronaries were free, capacious, and showed only a slight amount of fibrous sclerosis. The aorta showed scattered all along it much fibrous and fibrocalcereous sclerosis. This was least marked in the ascending portion of the thoracic aorta. The pulmonary artery, veins, venae cavae, portal vein and radicles were negative.

The liver showed frank chronic passive congestion. The pancreas was negative. The spleen did not weigh much—126 grams—but was a thick, chunky organ with a dark brown-red elastic tissue. The adrenals were negative. The kidneys' combined weight was 275 grams. Except for passive congestion they were negative. The prostate, seminal vesicles and testes were negative. There was a small hydrocele on the left, a very small one on the right, and a small Meckel's diverticulum.

Microscopic examination of the kidney tissue showed some arteriosclerosis but no definite nephritis, and of the myocardium was negative.

A PHYSICIAN: Was it caused by the alcohol?

DR. CABOT: No, I do not myself believe so. I do not think we can name any effects of alcohol outside the liver and peripheral nerves. I think the most interesting thing here is that long delirium without any distinct brain lesions. I have seen it many times in old people. I suppose it is a combination of the poor oxygenation of the brain with the arteriosclerosis. I think this is a thing to remember, because I have known people to be accused of meningitis when it was something curable if the heart could have been improved.

#### CASE 13152

### A PROBLEM IN THE DIAGNOSIS OF BRONCHOPULMONARY DISEASE

#### MEDICAL DEPARTMENT

An unmarried Polish Jewess nineteen years old entered April 2, three years and a half

cough and hemoptysis, then went back to the hospital again with pleurisy. She was on the dangerous list a week and in the hospital a month. Six months before admission she weighed a hundred and sixty pounds, a month before admission 135 pounds.

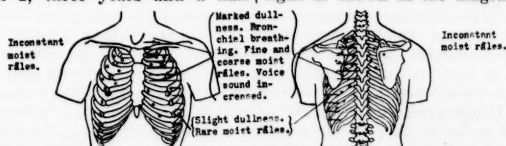
March 8 bronchoscopy at the Eye and Ear Infirmary showed a definite round non-ulcerating tumor in the left primary bronchus two or three centimeters beyond the bifurcation of the trachea. This mass completely filled the bronchus and moved readily with each respiration. Three small specimens were removed for examination. March 9 she was discharged, improved.

March 28 she reentered the Infirmary complaining of cough. She felt well. March 29 bronchoscopy of the left primary bronchus showed the tumor mass covered with grayish slough and occluding the bronchus two or three centimeters beyond the bifurcation. A large portion of the growth was removed. There was a moderate amount of bleeding. Two one-milliecurie seeds of radium were inserted into the base of the tumor. Pulsation of the aorta was distinctly noted.

Two days after the bronchoscopy she sat up and felt fairly well. That evening she had headache, cough and vomiting, and pains all over her body. She could not sleep, and had prickling pain. With cough and breathing she had pleuritic pain in the front of the left chest. The following day she had chills. Upon entering the Massachusetts General Hospital April 2 she had not slept for two days, had taken only a glass of milk and a cup of coffee, and had had no bowel movement for two days.

Her family history is not significant. Her past history is negative. She appeared so ill that much of the routine history was omitted.

Clinical examination showed a pale, slender girl breathing with difficulty. Skin moist and clear. Lips and cheeks showed purplish flush, with a strikingly greater color of the left cheek than the right. Sclerae injected. Moderate pyorrhea. Chest motion limited on the left. Lung signs as shown in the diagram. Heart not en-



before her second admission, complaining of cough and pleuritic pain.

Four months before admission she had dry pleurisy. Since the onset of this she had had dyspnea on going up one flight of stairs. She was in a hospital for two months. She was tapped, but no fluid was obtained. While in the hospital she had a few night sweats. She was ill at home in bed a month with pleurisy,

larged; left border by percussion 8.5 centimeters, right border 3, supracardiac dullness 5 (?). Apex impulse localized and not forceful. Rate about 140. Sounds of very poor quality. Pulmonic second greater than aortic second. Soft systolic murmurs at base and apex transmitted over the precordia. Supracardiac dullness (5 centimeters?) only approximately accurate, blended with apex dullness. Abdomen moder-

ately distended and hyperresonant. Pulses of poor quality, rapid and easily obliterated. Blood pressure 85/60. Pupils and reflexes normal.

Urine: 33 to 80 ounces, specific gravity 1.014 to 1.016, cloudy at two of three examinations, no albumin. Sediment, occasional to rare leucocytes at three examinations, occasional red cells once. Blood: hemoglobin 80 per cent., reds 4,920,000, leucocytes 24,400 to 12,000, polynuclears 89 to 80 per cent. Wassermann negative. Blood culture, no growth. Sputum 4 ounces, watery, mucoid, frothy. Moderate number of polynuclears, many large squamous epithelial cells, numerous organisms, mostly pneumococci Type IV, also long Gram-negative bacilli; a few spirillae and diphtheroids.

X-ray. The right lung field was clear and the outline of the diaphragm on this side sharply defined. The right border of the heart appeared to be in normal position. The entire left lung was dull. The dullness was of even density throughout and obliterated the outline of the diaphragm. The shadow of the ribs could be faintly seen through it. The position of the gas bubble in the stomach suggested that the diaphragm on the left was high.

Temperature 105° at entrance, falling to normal by April 14. Pulse 160 to 71. Respirations 46 to 20.

By April 6 the patient was feeling better. No breath sounds were heard in the left lower lobe, and only distant bronchial breathing at the left apex, possible transmitted. By April 10 air was again penetrating the entire left lung. X-ray April 19 showed the heart shadow not visible to the right of the median line. The trachea and mediastinal shadows showed marked displacement toward the pathological side. Examination of the heart could not be made. The long bones were negative. By April 22 she was quite well subjectively. There was dullness over the whole left chest, distant vesicular breathing at the base, bronchovesicular breathing at the left apex. April 23 she was discharged to the Huntington Hospital.

That hospital reports that she was given a series of deep X-ray treatments during the next three days. Slight improvement followed. The next November she was in another hospital in a very bad condition. In December she had bronchoscopy and radium treatment at the Huntington Hospital, and a year later another series of deep X-ray treatments. A month after this her general condition was the same as it was a year earlier. In March, fourteen months after this, she reported at the Huntington Hospital that she had been quite well until a month ago, when she began to cough and raise a little blood. Another bronchoscopy was done, with removal of a specimen which proved inadequate for diagnosis, but apparently was not carcinoma. The following December she reported as not feel-

ing so well for the past two months. She was referred to the Eye and Ear Infirmary for further treatment.

The Infirmary reports that she was admitted December 30, three years and a half after her discharge from the Massachusetts General Hospital, and was bronchoscoped. A specimen of the tumor was removed with little bleeding. X-rays taken after injection of lipiodol into the left primary bronchus showed obstruction of that bronchus. Pathological report. "Tissue so badly crushed that it is difficult to interpret. The specimen consists of fibrous tissue deeply infiltrated with cells. Cells seem to be inflammatory in origin." The patient was discharged December 31 unimproved.

At her second admission to the Massachusetts General Hospital, January 7, a week later, her brother, who gave the history, said that she was generally much worse in winter; in summer she often felt quite well. A few days after the last bronchoscopy she began having chills, fever, and pain in the left chest.

Clinical examination showed a flushed, stuporous woman, readily roused but weak. Skin hot and moist. Mucosae cyanotic. Throat red. A questionable petechial spot on the right anterior chest. Breathing shallow. Left chest expanded less than right. At the left apex dullness and distant bronchial breathing. At the left base absent to diminished normal breath sounds, with inspiratory stridor heard over the hilus region. Heart enlarged or displaced to the left. An occasional gurgle heard low in the left axilla. Location of apex impulse not recorded. Left border of dullness 10.5 centimeters from midsternum, 1.5 centimeters outside the midclavicular line. Right border 2 centimeters, supraclavicular dullness 4 centimeters. Pulmonic second sound markedly accentuated. A to-and-fro rub heard to the left of the sternum, in the left axilla, and at the apex. In the second left interspace a pulsating systolic thrill. Blood pressure 115/70 to 97/47. Slight tenderness in the right lower quadrant.

Urine 44 to 190 ounces, specific gravity 1.005 to 1.018, no albumin, rare red cells at one of seven examinations, 0 to 5 leucocytes at two. Hemoglobin 65 to 80 per cent., reds 4,600,000 to 4,736,000, moderate achromia, 20,000 to 36,000 leucocytes, polynuclears 87 per cent., platelets increased. Wassermann negative. Non-protein nitrogen 20. Blood culture, two flasks, no growth. Sputum: no blood or tubercle bacilli; a great variety of organisms. Sputum injected January 7 and 10 into the same mouse, which died 14 hours after the second injection. Peritoneal fluid showed a variety of organisms.

Temperature 100.5° to 103.9°, pulse 120 to 152, respirations 27 to 43.

X-ray. No normal lung visible on the left. Lower two-thirds of the chest dull. In the

upper and outer portion there was a bright area which suggested gas either in the pleural space or in a cavity. Diaphragm not visible on this side. Heart and mediastinal contents displaced toward the left. Right lung appeared normal.

Two days after admission the patient was still critically ill and in mild vasomotor collapse. She had little dyspnea. There was considerable pain in the left chest posteriorly, controlled by morphia. The peculiar systolic rasp and pulsation in the left second interspace continued. The heart sounds were feeble, rapid. No murmurs were heard.

The morning of January 16 she suddenly complained of pain over the left precordium, became cyanotic, and lapsed rapidly into unconsciousness. Stimulants, including intracardiac adrenalin, produced no effect, and she died.

#### DISCUSSION

BY FREDERICK T. LORD, M.D.

The percussion measurements indicate, I should say, that so far as physical examination was concerned the heart was in the normal place at the date of the first entry. The X-ray report of the heart confirms the physical findings.

Could we know whether tactile fremitus was tested, whether voice and whisper were tested at the base?

MISS PAINTER: There is no record of any of the things you ask for.

DR. LORD: The urine showed nothing.

There is elevated temperature, pulse and respiration.

#### DIFFERENTIAL DIAGNOSIS

The history suggests a pulmonary disturbance, and in a pulmonary disturbance, as in any disturbance, it is important to note the evolution and grouping of the symptoms, especially the early symptoms, and adequately to characterize the individual symptoms. Here the initial symptoms were cough, dyspnea and pain. Nothing is said, however, about sputum, and the pain is not adequately described. This combination of pain, cough and dyspnea suggests pleurisy with effusion, and with the hemoptysis raises the question of tuberculosis.

On physical examination the physical signs are not all noted. There is a tendency to slip over the physical signs, more of a tendency, I think, since the X-ray came into its important use. Apparently the heart on first examination was in the normal position, and the signs, although they are incomplete and cannot be used satisfactorily because incomplete,—the signs may be said to be consistent with a pleural effusion in the left lower chest, and with consolidation with open bronchi above. But a few days later they said that air was again penetrating the left lung. Such a variability in

such a short time is not characteristic of pleurisy with effusion.

MISS PAINTER: Nothing is said about sputum.

DR. LORD: On January 7 it is said that breathing is diminished or absent at the left base, with dullness and diminished breathing at the left apex. We should like to know regarding the physical findings whether the interspaces were narrowed on this side, about the voice and tactile fremitus, and the presence or absence of rales. The gurgle in the left axilla suggests intestinal peristalsis, but it would have been desirable to know the frequency of occurrence and how it impressed the listeners. Peristaltic sounds rise in the chest on the left side to the fourth rib in front and behind to the midscapula, and they rise to a somewhat lower level on the right. So that this probably has no special significance if it is just a peristaltic sound.

Stridor suggests bronchial obstruction.

A thrill described as a "systolic thrill" and a "systolic rasp" might be due to pericarditis, which is apparently established by finding the pericardial friction. It might however be due to obstruction in the aortic or pulmonary valve. Such thrills are also heard in the presence of aneurysm; but there is hardly any question of aneurysm here. On the whole I suppose it is more reasonable to think that the thrill is due to the pericarditis, but I do not see why it should be localized in this region, and there are the other possibilities, especially the valvular lesions.

A flush on the left cheek observed on only one occasion suggests pressure on or at least a disturbance in the left sympathetic nerve. Pupillary disturbances, however, usually accompany such vasomotor signs, and I believe there is no mention of the pupils here.

I think it would be well if Dr. Camp would discuss the X-ray findings.

DR. JOHN D. CAMP: This is the X-ray taken at the first entry. The most interesting part is the marked dullness involving the left chest. It is of a uniform nature and obliterates the outline of the diaphragm, the normal lung markings, and the greater portion of the ribs. The heart shadow appears to be in about the normal position. If it is displaced it is a very little to the right.

The density of the shadow on the left is that of fluid, and in the presence of fluid it is usual to have the heart displaced; if it is not displaced we have to figure out why it is not. The usual causes for the absence of displacement are adhesions of some sort, or collapse of the lung.

The right lung field is essentially clear.

DR. LORD: What about the interspaces?

DR. CAMP: The interspaces I think are widened on the affected side. Up above, at least, they appear to be wider than on the opposite side. Lower down they are obliterated. The

diaphragm I presume is in about the usual position,—certainly not lifted to any great extent.

This plate was made on the 18th of April, and the interesting thing here is the position of the heart. It is not visible to the right of the spine, and I think this means that in the first plate we were dealing with fluid pushing the heart over a little, and in the second the fluid had been removed or absorbed and the heart had gone back, not to its normal position, because it is farther to the left than it ought to be. In addition we have this condition of the lung, with displacement of the heart and the mediastinal shadow. The displacement of the heart I believe is due to atelectasis of the lung, and there is probably some fluid. I do not believe the atelectasis of the lung itself would obliterate the outline of the diaphragm. The right lung is still clear.

This is the last X-ray, and shows the right lung still to be clear. The heart is still not visible to the right, and the lower portion of the left chest is obliterated by a shadow the density of which is still such that the diaphragm is not visible. This makes us think that there is probably some fluid. Of course the heart is part of it and atelectasis of the lung the rest.

These shadows in the upper part are new changes and of different density. They are diminished in density, and the appearance suggests air. That air is either within the pleural cavity—the lines running through it being bands of adhesions—or else this is air within the cavity of the lung itself. We have a smaller shadow down here which may represent air within a cavity. The mediastinal shadow is still displaced to the left. We evidently have an extensive process in the left lung, with displacement of the heart, apparently due to atelectasis, and if these shadows represent cavities, of course we have several, apparently a gangrenous condition.

DR. LORD: Why do you say that?

DR. CAMP: We have so many cavities. There is practically no good lung left.

DR. LORD: Couldn't that be in the pleura?

DR. CAMP: Yes, with interspersing lines of pleural adhesions. If we say fluid it might be in a cavity or encapsulated. Of course this patient had a good deal of X-ray treatment, and the question was whether these changes might be the aftermath of X-ray radiation. We know it can give a certain amount of fibrosis, but these changes are extensive and occurred within a very short period of time, so I do not believe they are due to X-ray treatment, but probably are due to the pathological process.

DR. LORD: The X-ray certainly gives us a clue as to the nature of the disturbance. The cardiac displacement, the increased density and the rapid change in the position of the heart are consistent, I should think, with an intermittent obstruction of the bronchus, or ob-

struction of the bronchus which was at first incomplete and later became complete. I should think it would also have to be said that it was consistent, as Dr. Camp suggested, with fluid, perhaps with some absorption of that fluid. But taken in connection with the physical findings the evidence is certainly rather in favor of intermittent obstruction, because on one day there were no breath sounds and within a day or two the air again penetrated the chest, and that taken with the X-ray findings suggests very strongly an intermittent obstruction of the bronchus.

The bronchoscopy really settles the diagnosis in this case as a bronchial obstruction, but as to the nature of the obstruction we are in doubt, except that it is called a tumor which might have been benign and of the fibroid type, perhaps inflammatory in origin, or malignant. The recurring fever, chills, and leucocytosis under the circumstances in this case may be taken to mean an inflammatory process behind the obstruction, a pneumonitis, an abscess which may be unruptured in view of the absence of sputum, or may be a collection of fluid in the pleural sac as Dr. Camp suggests. That would explain the lack of cough and the lack of expectoration. It would seem, if she had gangrene, that she would be likely to have a malodor about her; but if the gangrenous area were not ruptured there would be none. We have had such a case coming to necropsy,—unruptured and found only at necropsy.

The sputum is not distinctive in malignant disease except for the finding of tumor fragments. They said in this case that the sputum showed the Type IV pneumococcus. It is not clear how it was recognized. It can be said that Type IV cannot be recognized except by exclusion or by the agglutination or precipitation tests. It cannot be recognized by morphology and staining reaction alone.

MISS PAINTER: This was found by the Krumwiede test.

DR. LORD: That would recognize it by exclusion.

Let us discuss for a moment this matter of malignant tumors. They are in a very large proportion of the cases primary in the bronchi—in about ninety per cent. of the cases—while origin in the lung tissue itself occurs in only a small proportion. Early diagnosis in this group is of extreme importance because of the prospect of radical cure. There is a fairly typical clinical complex in these cases, and this complex is very suggestive of the diagnosis.

Patients with such tumors have as initial symptom cough, usually without expectoration. Later there is expectoration which is at first mucoid, then becomes mucopurulent, then at times becomes blood-streaked or has blood masses in it, or there may be hemoptysis. Then in the course of the illness there is dyspnea, which is usually a prominent and progressive

symptom. In this case the dyspnea apparently came early, and that is unusual. The dyspnea which occurs in these cases is usually due to atelectasis or to fluid in the pleural sac. Pain is a common symptom but is usually slight unless the pleura is involved. The temperature is elevated in about one-half of the cases, and there is in addition loss of weight and strength.

There are two groups of cases with respect to physical signs: (1) Those in which the pulmonary disturbance is in the parenchyma. Here we find a circumscribed area of dullness, with diminished breathing, voice, whisper and tactile fremitus. (2) In the bronchial type, which is much the most common, there is likely to be atelectasis, of which one is likely to find physical signs in the presence of an area of dullness with diminished to absent breathing, voice, whisper, and tactile fremitus. There is displacement of the heart to the affected side, and narrowed interspaces,—all of which should suggest the presence of bronchial obstruction. So far as my experience and knowledge of the literature are concerned there is no presence of the opposite type of bronchial obstruction with a valvular occlusion and consequent pulmonary inflation. I see no reason why this should not happen, and think it probable that a case will turn up in which there is a valvular obstruction from tumor as there is not uncommonly with foreign body.

Dr. Camp has spoken of the X-ray findings in these groups. Whether this type of X-ray which we see here represents the most common finding in tumors or not may be a question, but it seems probable that it does. I was very much struck, in a demonstration in Dr. Holmes' department by Mr. Hyde, who rounded up fourteen recent cases, by the prevalence of this type. In fact it was almost exclusively the type presented.

Mr. T. L. HYDE: Predominantly so, yes.

Dr. LORD: There are, however, other types which we see by X-ray. A dense shadow in the roots with radial projections, with displacement of the heart and mediastinum to the opposite side, contrary to this case, and also at times dense round or irregular shadows with well or ill defined margins in the lung fields. These are to be regarded as the type of new growth arising in the parenchyma of the lung. Occasionally one sees a type that may be spoken of as the miliary type, in which there are small dense areas similar to tubercles scattered through the lungs.

As to other ways of making a diagnosis: Exploratory puncture is inadvisable. Owing to the extreme importance of early diagnosis it is important to think of malignant disease when there is this complex, with such symptoms and physical signs, and to resort at once in such cases to bronchoscopy. If the bronchoscopy results in making a positive diagnosis of a malignant tumor in a bronchus leading to one lobe,

or if the tumor is shown as an outcropping from the parenchyma of one lobe, then lobectomy would be advisable. In cases in which the malignant process is in the lung parenchyma and in which the diagnosis cannot be made by bronchoscopy it would I think be advisable on sufficient grounds to do an exploratory thoracotomy, a perfectly feasible project under differential pressure anesthesia, and remove a piece for a certain diagnosis by that means.

Regarding the treatment of this group, it is up to the present a very discouraging matter. But there are in the literature a few successful removals which spur us on to hope that something more may be done for these cases. Jackson in 1917 removed by the bronchoscope an endothelioma of the right primary bronchus, and that patient was well a year and a half later. Heidenheim did a pulmonary resection for bronchiectasis and found a cancer in the wall of the bronchiectatic cavity. That patient died seven months later without recurrence. The cause of death was unknown. Sauerbruch successfully removed a carcinoma from the lung in two patients. In the first there was a fist-sized carcinoma of the left lower lobe. That patient was alive without a recurrence five years later. In the second patient the neoplasm was in the right lower lobe, and that patient was alive three years later.

In this case, owing to the site of the lesion in the left primary bronchus, any operative interference would have been out of the question. But as I have said, when the tumor is in the bronchus leading to one lobe lobectomy is feasible.

Regarding the diagnosis: Tumor of the left primary bronchus, probably malignant; atelectasis of the left lung; a questionable abscess or abscesses of the left lung; question of cavity or pneumothorax at the left apex; probably pneumonitis, pleuritis, and a question of some effusion into the pleural sac; and pericarditis.

Miss PAINTER: The pathological report on the specimen taken at the first bronchoscopy at the Eye and Ear Infirmary was "malignant tumor, probably carcinoma."

#### CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Malignant disease of the left bronchus.

#### DR. FREDERICK T. LORD'S DIAGNOSIS

Tumor of the left primary bronchus, probably malignant.

Atelectasis of the left lung.

Abscess of the left lung?

Cavity or pneumothorax at the left apex.

Pneumonitis.

Pleuritis, perhaps with effusion.

Pericarditis.

#### ANATOMIC DIAGNOSIS

##### 1. Primary fatal lesions.

Carcinoma of the left primary bronchus.

Gangrene of the lung.



2. *Secondary or terminal lesions.*

Serofibrinous pleuritis and pericarditis.  
Early acute intracapillary glomerulonephritis.

DR. MALLORY: There were some difficulties in determining the exact condition in the pleural cavity, as we were forced to do the necropsy through an abdominal incision. We noticed on opening the abdomen that the diaphragm on the right was rounded in the normal outline; that on the left, however, the diaphragm crossed transversely to the lateral wall of the chest, and then passed downward close to the wall, and was evidently fixed by adhesions at the angle between the two segments. On incision through the portion of the diaphragm which lay close to the chest wall we found a narrow walled-off cavity which did not contain fluid. An incision through the transverse portion allowed something like a liter of foul purulent fluid to escape. I cannot say whether or not there was air in the pleural cavity as well as fluid.

DR. LORD: Could you say what that appearance up there might be due to?

DR. MALLORY: I think perhaps I can—at least I can guess at it. Incision into the pericardium showed that it also contained seropurulent fluid, about 30 cubic centimeters in amount.

The right lung showed only emphysema. The left lung was completely atelectatic and was reduced to a gangrenous mass in which were left some remnants of fibrous tissue. There were large cavities in this containing both pus and air. I should say there was absolutely no useful lung parenchyma left.

The cause of this was a carcinoma lying in the left primary bronchus about two centimeters below the bifurcation of the trachea, extending downward into both the largest branches on that side. It completely filled the bronchus, but left a narrow passage through which we could force a probe, but which would have been quite insufficient to allow much air to pass. The obstruction must have been virtually complete. The tumor was unquestionably carcinoma, but rather atypical in character. There are two common types of bronchial tumors, one the epidermoid or squamous cell tumor and the other a tumor that obviously comes from the epithelium of the bronchi and in which one can often make out cilia. This tumor shows slight tendency to the formation of glands, but there are no cilia present, and it is not at all the usual picture of a bronchoepithelioma, which probably accounts for the rather wide variation in the early diagnosis made from insufficient specimens obtained at bronchoscopy.

The heart was left unopened in order to preserve it as a good specimen, but the aortic valve at least did not show any lesions. We

have not investigated the others. So that presumably this thick serofibrinous pericarditis was responsible for the friction rub and possibly for the thrill that was felt.

DR. LORD: Were there any metastases anywhere?

DR. MALLORY: There were no metastases so far as I can make out. In the immediate neighborhood of the tumor there was one gland which was enlarged and rather fluctuant. On incision it was filled with slightly reddish semipurulent material, and I could make out no tumor present in it. Certainly elsewhere there were no metastases.

The liver was extremely large, congested, rather cloudy and opaque in cross section. I think a degenerative process attributable to the terminal acute infection of the pericardium. The kidneys showed a very early beginning acute glomerulonephritis.

It is rather surprising that with that amount of fluid in the pericardium there should have been no shadow beyond the sternal margin.

DR. CAMP: I presume that it is due to the fact that so much of the lung was destroyed.

DR. MALLORY: Also perhaps the adhesions to the diaphragm pulled things over.

DR. LORD: How large was the tumor in gross?

DR. MALLORY: It was about two centimeters in length and thirteen to fourteen millimeters in width, rather conical in shape, with its base downwards, the apex extending up into the primary bronchus.

DR. CABOT: It does not get up into the lung itself?

DR. MALLORY: There is a very slight involvement around the base, but not over a centimeter, just where it is attached. One could not have done a lobectomy. If one could have taken out the entire lung she could have been entirely cured.

DR. LORD: That has been done in dogs, but I know of no instance in human beings in which total removal of one lung has been successfully performed.

Mr. Hyde has a few figures that might be found interesting this case.

MR. HYDE: Adler\* summarized all these cases, 374 carcinomas, 94 sarcomas, in 1912. Some of his statistics are of general interest, though I was interested purely from the roentgenological viewpoint. The predominance is largely carcinoma. The age incidence is about fifty to sixty. The right lung predominates, fifty-four per cent. About ten per cent. are bilateral and the rest are left lung. Ante-mortem diagnosis varies in different clinics from ten to ninety per cent. More recent publications are apt to give a higher per cent. of diagnoses. Tuberculosis and pneumoconiosis are not particularly impor-

\*I. Adler, Primary malignant growths of the lungs and bronchi. Hooper, 1912.

tant in association. The apex is usually clear, and fluid is rather rare in a primary tumor of the lung, in contradistinction to metastatic malignancy.

This case is rather of interest in being typical of the kind of carcinoma which occludes the bronchus. I think the more typical kind produces atelectasis, but does it by stenosis and is a more rapid process than this.

DR. LORD: Did you find any cases in the literature that had gone as long as this and had not metastasized?

MR. HYDE: No. Adler had some cases that had gone several years, but they all showed metastases post mortem.

DR. CABOT: Dr. Lord, is cancer of the lung getting commoner?

DR. LORD: I don't know.

DR. CABOT: The people at the Brigham Hospital felt quite strongly that it is. They said that when Dr. Adler was here looking for cases a while ago they could get only two, and now they have them all the time.

DR. MALLORY: That is very strongly the opinion in Vienna. In the last two years in the Allgemeiner Krankenhaus, if I remember correctly, they had more than in the entire period from 1900 to 1910.

MR. HYDE: I found a distinctly higher incidence in the literature during the last six years. This is ascribed by some to the influenza epidemic.

#### RADIO MEDICINE BY CODE

THE American Code Committee in association with New York medical men is working on the adoption of an international medical code which will be useful to ships at sea when cases of illness occur.

The code will deal with diagnosis and treatment which can be sent by radio.

The custom of passing medical advice from ship to ship and from hospitals ashore has been adopted to a considerable extent.

The radio medical service was first established by the Seaman's Church Institute, according to statements in the *New York Times*.

#### SOME FEATURES OF MEDICAL WORK UNDER THE AUSPICES OF THE FAMILY WELFARE SOCIETY

A STUDY of the health conditions of five hundred from among more than thirty-five hundred families dealt with by the Family Welfare Society, by Dr. Hilbert F. Day, brought out interesting facts.

Sickness was found to be the most important problem with which the Society has to deal. These five hundred families consisted of nearly twenty-five hundred individuals of which number eleven hundred and ninety-five were given medical treatment, with a slight preponderance

of cases among the children. The range of diseases covered most of the illnesses for which physicians are called. Nine hundred and sixty-four cases of acute illness received hospital treatment. The chronic cases numbered one hundred and eighty, of whom eighty-eight required hospitalization.

This study by Dr. Day gives valuable statistical data with respect to the problems of illness which may be found in average families.

#### DEATHS DUE TO LEAD POISONING

DR. F. L. HOFFMAN has made a study of the mortality due to lead poisoning in this country. He finds that there is a progressive decrease in the number of deaths from this disease during the period 1910 to 1924, the rate for 1910 having been 2.5 per million, and 1.4 in 1924.

During eleven years 1914 to 1924, there were 1592 deaths, painters leading among the groups studied. Lead workers, printers, paint mixers, potters, and tile workers contribute smaller percentages.

Among the groups not employed in various forms of lead industry sixty-one farmers died, most being from the use of drinking water conveyed through lead pipes.

Much interesting statistical evidence may be found in bulletin No. 426 available from the Bureau of Labor, Washington.

#### WEEKLY HEALTH INDEX SUMMARY

TELEGRAPHIC returns from 68 cities with a total population of thirty-million for the week ending March 19, indicate a mortality rate of 14.1 as against 18.2 for the corresponding week of last year.

The annual rate for 68 cities is 13.9 for the eleven weeks of 1927, as against a rate of 15.6 for the corresponding weeks of 1926.

Although in some foreign countries many deaths from epidemic influenza have occurred recently, the figures from the large cities reporting to the Weekly Health Index show no alarming increases this year in the number of deaths from influenza and pneumonia combined.—*Department of Commerce Bulletin*.

#### INFLUENZA INCIDENCE LESS THAN ONE-THIRD OF THAT OF LAST YEAR

THIRTY-TWO STATES REPORT ONLY 2,506 CASES; EPIDEMIC SUBSIDES IN EUROPE

A GENERAL decline in the number of influenza cases is reported to the Public Health Service from the several states for the week ended March 12. In its weekly statement, the Public Health Service reports that in all the 32 reporting states there were 2,506 cases of influenza for that week as compared with 9,532 for the corresponding week in 1926.—*U. S. Daily*.

## THE BOSTON Medical and Surgical Journal

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### THE OPENING OF THE PALMER MEMORIAL HOSPITAL

ANOTHER addition to the hospital facilities for the treatment of cancer and other chronic diseases will be available for those who need such service with the opening of the Palmer Memorial Hospital by the New England Deaconess Association, among the buildings erected in connection with the Deaconess Hospital as set forth on page 254, Vol. 194, of this JOURNAL. The announcement of the dedication and opening of this hospital appears on page 632 of this issue. The purpose of this institution has been set forth in the words of Dr. Joslin as follows:

"A better coöperation between existing institutions will allow a more effective distribution of patients. One hospital can treat this disease best, another that. The education of the patient, too, is a part of this plan of treatment. You cannot educate a man in the quick course of pneumonia, but in slower diseases such as diabetes the life of the patient, young or old, depends on education. In chronic disease education is vital. Diagnosis is all-important in a chronic disease, because the patient lives to think and wonder. Coöperation will lessen expensive diagnosis. Better coöperation will lessen the cost of X-ray, radium, and maintenance of a laboratory. But coöperation will do still more. It will stimulate an exchange of ideas between superintendents and hospital staffs. It will

promote renewed interest in patients. Such a cooperative effort is bound to be recognized by the medical profession, and the physician in general practice who has a single case of one disease will seek the center which has many.

"More beds, better treatment, economical use of expensive apparatus, education of the patient, fuller coöperation between existing institutions both in administrative as well as a medical way, are assured by the new Palmer Memorial Hospital in its removal to a new neighborhood."

The coöperation of the Department of Health of the Commonwealth and the hospitals now dealing with cancer with the Palmer Memorial gives promise of important advances in the study and treatment of this disease. Massachusetts has contributed a great deal to medicine and her physicians will continue to occupy prominent places in the contest with disease.

This hospital has been made possible by anonymous donors of comparatively large amounts of money but the endowment may be increased to advantage.

The physicians who will carry on this work should have the enthusiastic support of the medical profession to the end that charitably inclined persons may be led to supply the means for the most comprehensive and intensive study of the problems which are ahead.

Cancer is one of the major afflictions of mankind, and successful treatment of all of the phases calls for a solution of the mysteries of its origin. Several of the scourges of the human race have been overcome by scientific study and concentration of well-trained minds on this particular disease will undoubtedly unlock the door to full understanding.

We urge a large attendance of physicians at the opening exercises of the Palmer Memorial Hospital as a demonstration of the support which will be given to those who will carry on the work of this institution.

### THE AFTERMATH OF THE VACCINATION CAMPAIGN

ONE of the papers, apparently jubilant because of the defeat of the vaccination bill by the State Senate, quotes the points made by some of the Senators as follows:

Hugh H. Cregg of Methuen maintained that the doctors do not agree on the merit of the practice and amplified his remarks in referring to the risks of vaccination.

William I. Hennessey of Boston claimed that he had had an unfortunate experience with vaccination which caused suffering and sorrow.

Henry L. Kincaid of Quincy asserted that to make vaccination compulsory would be to put the treatment of children on a plane with branding of cattle.

Walter E. McLane of Fall River said that six physicians of Fall River had told him that they thought that vaccination ought to be abolished.

The first objection we believe to be a gross ex-

aggragation for we believe that at least ninety per cent. of well educated physicians believe in vaccination. A few people still believe that the earth is not a sphere, but this small minority has no influence with intelligent people.

So far as Senator Hennessey is concerned, everybody will sympathize with him but his experience is one of the extremely small number of illustrations of any harm following vaccination. We suggest that the record of the millions of vaccinations employed in the armies of the world war show that vaccination properly performed is practically a safe procedure and its benefits outweigh by a large margin all accumulated evidence to the contrary. Even with the very small fraction of one per cent. of alleged bad results, vaccination is a necessary public health measure and is today almost entirely devoid of the comparatively rare complications of a few years ago. So far as the comparison of branding of cattle with vaccination is concerned, we see very little logic.

We are interested in Senator McLane's statement. Of course we know where Dr. Padelford of Fall River stands. His arguments are based almost entirely on statistics which have been explained and the alleged potency of vaccinations in poisoning the system. He ignores the common incidence of many common infections which we believe have existed and will continue to exist in vaccinated and unvaccinated persons, and he seems to be unacquainted with the function of the human body in establishing immunity to disease by the development of resistance to infections brought about by a previous invasion of specific organisms naturally or artificially introduced. We believe that he is sincerely honest, but that his prejudice is so deep rooted that his mental vision is obscured. He may have been one of the men referred to by Senator McLane, and if so, there are five others. It is strange that the names of these objectors cannot be ascertained. Dr. S. B. Woodward has asked for them. Perhaps Senator McLane will give them. The Fall River Medical Society is unaware of the names of these associates of Dr. Padelford.

Although the great majority of physicians endorse vaccination, the assertions of the opponents have weight with those who are not in sympathy with scientific medicine and some others who believe in personal liberty even to the extent of endorsing a potential danger.

If communities and individuals could be led to employ the important agencies which prevent the incidence of disease, much would be added to human happiness and prosperity. The great problem of existence seems to be found in combating prejudices founded on erroneous reasoning.

The program of education must be carried on with charity for all believing in the right as we see it.

### "EMULATING METHUSELAH"

DURING the last half century the traditional span of human life has apparently crept up from three score years and ten, once regarded as a ripe old age, to the century mark. This does not mean, of course, that the average length of human life has reached anywhere near such a point, but it is obvious, on all sides, that we tend to consider death at seventy as occurring too soon, rather than being ripe old age. The number of men in active affairs, well over seventy years of age, is striking evidence of this change. Judge Gary and Rockefeller are two outstanding examples of men who have declined to consider life as ended for them at three score years and ten.

However, one wonders whether we are any more justified in setting one hundred years as a natural limit of human life, than we were in establishing seventy years as an arbitrary gateway to the grave. Certainly the striking work of investigators in all lines, more particularly those in the biology of the cell, has shown that any arbitrary limitation of length of life is not justified. We know that under proper conditions cells are potentially immortal, and it stands to reason, if we reduce the attacks of infectious and parasitic diseases on the organism, we materially improve the conditions under which it exists. The average age at death has now advanced to fifty-eight years, largely through improved public health and sanitary conditions, and undoubtedly far more people are living to a greater age than ever before. The present goal for human life seems to be one hundred years, but biologically at least, there is no apparent reason why we should consider the century mark as an arbitrary barrier beyond which the majority of human beings may never pass.

### THE MENACE OF THE RAT

THE United States Public Health Service has given special attention to the influence of the rat on public health. Rats exist in numbers equal to human beings in the country it is believed. The distribution of these animals depends very much upon the food supply. They eat almost anything and are especially fond of the foods upon which human beings thrive. Their depredations impose a loss of \$180,000,000 each year in the United States.

There are several species of rats of which the brown rat is most prolific, having litters three or more times each year; as many as twenty have been found in a litter. Among the diseases caused by rats are bubonic plague, trichinosis, acute infectious jaundice, dysentery, tapeworm, and rarely, rate bite fever. The "Black Death" of the fourteenth century was due to plague. This disease has occurred in this country on the Pacific Coast and the Gulf States, but was

promptly controlled. Plague is spread from rat to rat by fleas and through the same vehicles from the rat to human beings. Other rodents are susceptible to the infection. Hogs contract trichinosis by eating infected rats and offal.

It can be readily seen that rats constitute a public health problem which receives little recognition outside the field of regular systematic public health work. Few people are particular about rat-proofing houses, and farmers' barns and piggeries are breeding places for rats. The government is active in seaboard cities in keeping down excessive numbers of rats, and especially so in the presence of impending epidemics, but the problem reaches out to all who maintain homes or industrial plants which are not rat-proof.

Great advantage would accrue to even small communities if united efforts could be undertaken in a campaign against this enemy of the human race, but individual effort is usually spasmodic and inefficient. The government will give advice as to details upon solicitation.

#### THIS WEEK'S ISSUE

CONTAINS articles by the following authors:

ROBEY, WILLIAM H., A.B.; M.D. Harvard Medical School 1895, Assistant Professor of Medicine Harvard University Medical School, Visiting Physician Boston City Hospital, Consulting Physician Milton Hospital, President New England Heart Association, Vice President American Heart Association. Address: 202 Commonwealth Avenue. Associated with him is

FREEDMAN, LOUIS M., A.B.; M.D. Harvard Medical School 1904, F.A.C.S.; Visiting Surgeon Ear, Nose, and Throat Department, Boston City Hospital, and Beth Israel Hospital. Address: 475 Commonwealth Avenue, Boston. Their subject is: "The Effects of Tonsillectomy on the Acute Attack and Recurrence of Rheumatic Fever." Page 595.

MEIGS, JOE VINCENT, A.B.; M.D. Harvard Medical School 1919, F.A.C.S.; Surgeon to Out-Patients, Massachusetts General Hospital, Assistant Surgeon to Out-Patients, Collis P. Huntington Memorial Hospital; Surgeon to Vincent Memorial Hospital. The title of his paper is: "Adenomyoma of the Recto-Vaginal Septum" (a report of three cases treated by three different methods and their results). Page 601. Address, 286 Marlboro Street, Boston.

JEPSON, PAUL N., B.A.; M.S.; M.D. University of Pennsylvania 1920, Fellow in Orthopedic Surgery; First Assistant in Section on Orthopedic Surgery, Mayo Clinic. His subject is: "Postoperative Treatment of Amputation Stumps in Preparation for the Early Application of the Artificial Limb." Page 606. Ad-

dress: Section on Orthopedic Surgery, Mayo Clinic, Rochester, Minn.

TOWNSEND, JAMES H., M.D. Harvard Medical School 1921, Massachusetts General Hospital House Officer 1921-1923, Assistant in Department of University Health, Yale University 1923-1924; Health Director St. Paul's School, Concord, N. H. His subject is: "Specific Preventive Measures in Diphtheria, Scarlet Fever, and Measles." Page 611. Address: Health Director, St. Paul's School, Concord, N. H.

MEAKER, SAMUEL R., A.B.; M.D. Harvard Medical School 1915, M. R. C. S. England 1919, Associate Professor of Gynaecology, Boston University School of Medicine. His subject is: "A Uterine Index of Development." Page 615. Address: 475 Commonwealth Avenue, Boston.

#### MISCELLANY

##### A RECORD OF EFFICIENCY

AUBURN, NEW YORK, has not recorded a death due to diphtheria during the past three years. The last death due to this disease occurred March 9, 1924.

In 1922 Schick immunization was started in Auburn. The conditions with respect to this disease were particularly discouraging. In 1921 there were thirteen cases with thirteen deaths.

The State Department of Health selected Auburn as the place in which a demonstration should be made, and six thousand one hundred complete immunization treatments were given. A large proportion of the children have been reschicked and found to be negative. The opponents of the Schick test in Auburn have been converted and the procedure is generally and heartily endorsed. The Health Officer is reported to be deluged with requests for information from health departments and physicians all over the United States, and even as far off as the Philippines.

##### THE SO-CALLED VANISHING DISEASE

RECENT epidemics of typhoid fever in Massachusetts and other localities will tend to create conservatism in speaking of the infrequency of this disease.

The hospitals in Montreal are overflowing with typhoid fever patients, seven hundred and five cases having been reported since March fourth, according to press reports bringing the number since January 1 up to over fifteen hundred.

Like most recent epidemics milk seems to have been the vehicle by which the disease has spread.

This "vanishing" disease will vanish more generally when pasteurization becomes general.



### THE MONTREAL EPIDEMIC OF TYPHOID FEVER

ON April 8 inst., the health authorities of Montreal reported that the typhoid epidemic was under control, that the reports had been exaggerated, and that visitors to the city could feel perfectly safe. With this statement, however, the report includes the recording of sixty-nine new cases on that day.

Perhaps it is in order to ask what constitutes an epidemic and whether the report of sixty-nine new cases indicates the termination of the spread of the disease.

### RECENT DEATH

**BAXTER**—DR. WILLIAM ELIHU BAXTER of Topsfield died at St. Augustine, Fla., April 4, 1927, aged 63.

A cousin of former Governor Baxter of Maine, he was born in Portland. He received his medical education in Bellevue Hospital Medical College, where he took his M.D. in 1887. During the World War he was a captain in the Medical Corps of the Forty-second Division and after his health broke down while ministering to the troops in France he was retired from further service.

He is survived by his widow, Helen (Pennell) Baxter, and two sons, Dr. Clarence Baxter of Santiago, Cuba, and Harry B. Baxter of New Rochelle, N. Y.

### OBITUARIES

#### DR. NELSON MERWIN WOOD

Dr. Nelson Merwin Wood was born in Sheffield, Vt., on May 12, 1866. After an exceptionally useful and active professional life of almost thirty-four years, on March 13, 1927, at the Massachusetts Homeopathic Hospital, he was released from the burdens of the flesh and passed into the Great Hereafter. His last days had been days of keen suffering; so much the more blessed the release.

Dr. Wood's classical education was obtained at the Lyndon Literary Institute and after graduating therefrom he taught school for two years. He had, however, decided to study medicine and in carrying out a cherished ambition he left his native state and entered Boston University School of Medicine, from which school he was graduated in 1893.

After his graduation Dr. Wood settled in Charlestown where he established a very successful practice; but with the inevitable shifting of population and the economical and social changes which occur in most communities his practice became urban and suburban and he transferred his office to Bay State Road, and later on to Commonwealth Ave., and moved his residence to Brookline.

Dr. Wood was a typical family physician and his thoroughness, clear insight, gentleness, patience and sympathy made him a favorite and

adored family medical councillor, while his broad catholicism in therapeutics permitted his adaptation to the varying illnesses that came before him.

In 1910 Dr. Wood was appointed to the staff of the Massachusetts Homeopathic Hospital and gradually moved from the position of Assistant Visiting Physician to become Chief of the Medical Service. One of Dr. Wood's various and cherished activities was in connection with Boston University School of Medicine. He was a member of the faculty of the school from the year 1904 until his death. In a quiet unostentatious way he showed his adaptability, versatility and desire to serve the cause of medical education by giving instruction first in Sanitary Science, then in Diseases of Children, and in 1910 and thereafter in Clinical Medicine. He was appointed Professor of Clinical Medicine in 1918, the title being changed to Professor of Medicine in 1926. He also served the school on the Committee on Hospital Relations and Clinical Instruction and the Advisory Committee.

Dr. Wood was not a contributor to medical literature and so his wide reading, exceptional experience and mature judgment were not passed on to the profession, but his students in lecture room and clinic reaped the benefits of his knowledge and judgment and experience. Though humble, reticent and rather retiring in disposition he was never indefinite in his opinions which were expressed with force and clarity. In the essay written at the time of his matriculation into Boston University School of Medicine, Dr. Wood showed an idealism, ambition and Christian character which were the foundation of his after life, for he was ever charitable in his judgments of people and their actions, was cheerful, gentle and sympathetic with sick people and their relatives, nurses and students.

Dr. Wood leaves behind to mourn and miss him, an invalid wife and two married daughters.

He was a member of the Massachusetts Homeopathic Medical Society, and the Massachusetts Medical Society.

#### JOSEPH SMITH LOCKHART, M.D.

THE late Dr. Joseph Smith Lockhart was born in Horton, Nova Scotia, of Scotch and American parentage. His father was a sea captain and as it was a common custom in those days for a captain to take his family on long voyages, the boy found himself at sea with his mother at the early age of eight years.

When he was twelve years old, he was considered an ordinary seaman and could stand a watch and steer a trick with the best of the sailors. During one of his father's trips to

Europe, he was left at school in Belgium. Going one season to sea and one season to school, he arrived at the age of twenty-one. He had mastered navigation and had shown himself to be such a good sailor that he received the certificate as Master's-mate and was offered the command of a ship.

Now came the turning point in his life. He had never liked the sea; he had always a bent toward medicine, but his father, a hard-headed Scotchman, like many other parents, could not conceive of the child that had grown up about his knees as a full-fledged physician. He was strongly opposed to his son studying medicine; the thought itself was to his mind ridiculous. In this dilemma, the young man consulted the late Dr. Sawyer, of Acadia College, who advised him to enter that institution. He accepted Dr. Sawyer's advice and after graduating at Acadia, he entered the University of the City of New York. Here he took the four years' course in two years and graduated as a Doctor of Medicine in 1885.

He now made application for an internship in three hospitals and received an appointment in two of them. He accepted the one offered him at the St. Catherine's Hospital in Brooklyn, where he served two years.

In 1887 he came to Boston and was associated for some time with the late Dr. Cilly. He then opened an office of his own at 3 Temple Street, afterward removing to the Warren Chambers. In 1889 he married and settled in Cambridge where he continued in active practise up to within a few years of his death.

Among the many accomplishments of the late Dr. Lockhart, was his mastery of foreign languages. French and German he acquired in Belgium. He could speak and write both of these languages like a native and a Frenchman or German, after conversing with him, always left him with the belief that they have been talking with a fellow-countryman. Italian he picked up from an Italian mate in their long night watches at sea. Making up his mind to visit Spanish South America, where he had a son employed in Costa Rica, he mastered the Spanish language. Having access to the best that was in the printed word of all these languages, his appreciation of good literature was of a high order.

There was no question in the mind of the late Dr. Lockhart about the seriousness of the disease that fell upon him in his last years. Although his friends and advisers in their enthusiasm sometimes deceived themselves, he was not deceived. Having arrived at the Biblical allotment of life, and seeing all his children well established, he set his worldly affairs in order and calmly awaited the inevitable.

On the first day of March, 1927, to use a line that he himself was often fond of quoting, "he

fell into that dreamless sleep that kisses down his eyelids still."

"Home is the sailor, home from the sea."

Prepared for the Cambridge Medical Improvement Society by Dr. W. C. Archibald.

## CORRESPONDENCE

### SUSPENSION OF THE REGISTRATION OF DR. ARTHUR STANTON HUDSON

April 4, 1927.

*Editor, Boston Medical and Surgical Journal:*

This is to inform you that the Board of Registration in Medicine did by vote taken March 31, 1927, suspend until further action of the Board the registration of Dr. Arthur Stanton Hudson.

Very truly yours,

DR. FRANK M. VAUGHAN, *Secretary.*

### OBJECTION TO NONSPI

Bernard Appel, M.D.  
485 Commonwealth Avenue  
Boston, Mass.

March 22, 1927.

*Editor, Boston Medical and Surgical Journal:*

People who live in glass houses should not bathe in the daytime. Your recent editorial criticisms of two of Boston's newspapers is to be commended as a step in the right direction to guide suffering humanity away from the quacks and nostrums. But, through your own advertising columns you have been tacitly urging the doctors to use a preparation thus described on page 83 of Vol. 2, Nostrums and Quackery, A. M. A.:

"Non Spi:—sold as a preventive of perspiration in the armpits. It was analyzed by the chemists of New Hampshire who reported"—"that it consists of a solution of Alum, with some Iron in dilute Hydrochloric Acid."—"The statement 'perfectly harmless' is not justified."

The dermatologist sees frequently, in consultation, cases of dermatitis superimposed on dermatoses as the result of the use of ointments and lotions sponsored by the various pharmaceutical houses and "ethically advertised." I feel that here is another preparation which has potential harm to the skin and ought not to be advertised in a medical journal, if at all.

Sincerely yours,

BERNARD APPEL, M.D.

NOTE:—We are appreciative of constructive criticisms and in explanation of the acceptance of Nonspi we would like to have the profession know how it came about.

In company with the majority of the State medical journals, this JOURNAL accepts advertisements of medicinal preparations which have been approved by the Council on Pharmacy and Chemistry of the American Medical Association.

The Coöperative Medical Advertising Bureau solicits advertisements from manufacturers of products approved by the Council and no others, and distributes such advertisements among the State journals.

The Agent of the Bureau sent in the advertisement for Nonspi with the information that it is no longer under the ban of the Council.

If there is evidence tending to show that this preparation is harmful, we do not want to advertise it, and if there is testimony to that effect we will appreciate the information.

Our correspondent quotes the statement of the New Hampshire chemists and not the opinion of the Coun-

cill on Pharmacy and Chemistry which gives the statement of the New Hampshire chemists for what it may be worth. Alum, iron and hydrochloric acid in weak solutions may not be harmful. Perhaps our correspondent has testimony that it is.

THE REVIEW OF THE BOOK ENTITLED  
"SYMBIONTICISM AND THE ORIGIN  
OF SPECIES"

University of Colorado  
School of Medicine  
Denver, Colorado

Department of Anatomy

March 22, 1927.

Editor, Boston Medical and Surgical Journal:

In a book review on "Symbiontism and the Origin of Species" published in the BOSTON MEDICAL AND SURGICAL JOURNAL (Vol. 196, No. 9, March 3, 1927), the statement is made that "The whole structure built by Wallin is actually founded on one research in which he claims to have cultivated mitochondria by the use of bacteriological methods."

I wish to call your attention to the error of this statement. In the first place, I have published six papers on the nature of mitochondria which are records of experimental research. The first three of these papers contained the records of experiments dealing with the comparative reactions of mitochondria and bacteria. The last three papers contained the records of experiments in cultivating mitochondria in artificial culture media. The final paper in this series contains what the author believes to be conclusive evidence that the upgrowth in the culture experiments were not contaminations. These papers were published in the *American Journal of Anatomy*; the last paper in Vol. 36, No. 1, 1925, contains references to the earlier papers.

In the second place, my hypothesis on the origin of species is not founded on my mitochondrial work alone, but also on the evidence that is given (for the first time) in the chapters on "Microsymbiosis" and "An Analysis of Symbiont Reactions" in the book reviewed.

Thanking you for the courtesy of publishing the above corrections, I am,

Very truly yours,  
IVAN E. WALLIN.

NOTE:—Comment by the person who wrote the review is that "The reviewer by one research means the series of experiments upon which Wallin based his conclusion that mitochondria are cultivatable. The importance of symbiontism in the origin of species depends upon the universality of symbionts. In case mitochondria are not micro-organisms capable of independent existence, such universality of symbionts does not exist. Hence, interesting as the facts are in regard to microsymbiosis the foundation stone of Professor Wallin's book is his conclusion in regard to the bacterial nature of mitochondria."

A REPLY TO THE LETTER OF DR. RAY G.  
HULBERT

76 Reservoir Street  
Cambridge, Massachusetts

29 March 1927.

Editor, Boston Medical and Surgical Journal:

May I use your JOURNAL to answer a letter from Dr. Ray G. Hulbert, American Osteopathic Association, in criticism of my article in the February 3rd number of the JOURNAL? A copy of this letter had been mailed to me but I refrained from answering it until publication of the letter in the JOURNAL.

Dr. Hulbert in his letter makes reference to industrial compensation laws and the relation of the osteo-

path to them. If he will re-read my article, he will note that I have not made any reference to industrial compensation, but to "Relief Benefits" in industry, which are a distinct entity in the relationship of medicine to industry.

I specifically quoted rules and by-laws for Relief Benefits of an especial industry. These laws are written by the industry for the protection of its employees. The only certificate recognized by the industry is that of a *duly licensed physician*. The interpretation of this last clause is made by reference to the practice acts of different States. Some States have limitation of practice laws and varying standards for registration to practice.

It would be splendid if all osteopaths would come under laws such as we have in Massachusetts and New York making a single standard of fitness for all practitioners for the sick. There would then be no opportunity to question certificates and the industrial physician would be saved considerable time and correspondence in checking up irregular certificates.

As to including osteopaths with chiropractors in this article, it was the intent of the writer to convey to the readers of the JOURNAL that any of the practitioners who might be limited in their practice by State laws would not be recognized as duly licensed physicians by industries which contribute Relief Benefits to their employees. The industrial physicians do not hesitate to inform themselves of the multiplicity of practice laws when their official duties require them to check up the treatment given the employees in their particular industries.

My article was a warning to osteopaths and chiropractors to watch their certificates, and especially those issued by practitioners licensed under limitation of practice acts.

Very sincerely yours,  
DAVID H. GIBSON, M.D.

CONNECTICUT DEPARTMENT OF HEALTH  
MORBIDITY REPORT FOR THE WEEK ENDING  
APRIL 2, 1927

Diphtheria	20	Encephalitis, epidemic	1
Last week	20	German measles	14
Diphtheria bacilli carriers	9	Influenza	11
Scarlet fever	94	Mumps	46
Last week	136	Pneumonia, lobar	50
Measles	102	Septic sore throat	2
Last week	115	Tuberculosis, pulmonary	32
Whooping cough	38	Tuberculosis, other	2
Last week	47	forms	43
Bronchopneumonia	31	Gonorrhea	26
Chickenpox	85	Syphilis	

NEWS ITEMS

REMOVAL OF OFFICE OF DR. EDWARD S. CALDERWOOD—Dr. E. S. Calderwood has moved his office from 223 Warren Street, Roxbury, to 510 Commonwealth Avenue, Boston.

BAR ON MONTREAL MILK TO REMAIN IN EFFECT—The embargo on milk importation from Montreal and vicinity, applied as the result of a typhoid outbreak there, the United States Public Health Service announced on April 5, cannot be removed with safety until Canadian health authorities determine the source of the disease.

Reports received by the Service state that although the actual cause of the outbreak, which was represented by about 1,500 cases occurring from March 4 to March 30, had not been determined, "indications are that the milk supply of the city is infected."

"This assumption," the Service declared in a statement April 5, "was made from the fact that two-

thirds of all the typhoid fever cases present in Montreal on March 26 were obtaining the milk from one dairy which distributed milk to only one-eighth of the population."

Other investigators have been of the opinion that the water supply of Montreal was partly, at least, responsible for the widespread prevalence of typhoid fever, but this possible source of spread has not been definitely proven.

It is understood that at the present time all milk sold in Montreal is being pasteurized at a higher degree of temperature than that usually employed so as to insure proper sterilization of milk.

The city is distributing free of charge anti-typhoid vaccine to all persons desiring to be inoculated against typhoid fever.—*United States Daily*.

**THE MEDICAL COLLEGE IN PEKING IS NOT CLOSED**—The Rockefeller Foundation is quoted as reporting that the staff of the Peking Union Medical College are still at their posts.

**POSTGRADUATE STUDY IN MEDICINE PROVIDED FOR HAITI DOCTORS**—The Rockefeller Foundation has granted a series of scholarships to the National School of Medicine and Pharmacy in Haiti which will enable young doctors to study in the medical centers of the United States and Canada.—*United States Daily*.

## NOTICES

### ERRATUM

In the notice of the appointment of Dr. William T. Hopkins, in the issue of April 7, as Health Commissioner of Lynn, Mass., his first name was incorrectly printed.

### THE PALMER MEMORIAL HOSPITAL

The New England Deaconess Association and the Staff of the Palmer Memorial Hospital cordially invite those interested to inspect the new building of the Hospital, 195 Pilgrim Road. The Hospital will be open to visitors April 21 to 24 inclusive, from ten o'clock in the morning to six o'clock in the afternoon. The building will be dedicated April 19, with Bishops W. F. Anderson and W. P. Thirkield as the chief speakers.

The Staff has planned the formal opening of the Hospital Wednesday, April 20, at 4:30 P. M. Dr. George H. Bigelow, State Commissioner of Public Health, will speak on "The Cancer Problem in Massachusetts" and Dr. Robert B. Greenough, Director of the Huntington Memorial Hospital, will speak on "The Special Cancer Hospital."

The Palmer Memorial Hospital is built and equipped to care particularly for cancer sufferers, both in the early and advanced stages of the disease. The new building with its equipment has cost about \$650,000, and a new nurses' home, to be used for the Deaconess Hospital as well, is being constructed at a cost of \$400,000.

While planned for chronic patients, the Hospital has all the equipment found in the best institutions for acute cases. A particularly important feature is a large and well equipped

pathological laboratory, as neoplastic diseases above all others demand adequate laboratory diagnosis and investigation.

In order to make available the facilities of the Hospital to more than the seventy-five patients for whom beds can be provided, an out-patient department for the diagnosis of tumors and the treatment of ambulatory cases is established. So far as possible, only those patients referred by their family physicians will be admitted to the out-patient department, which aims to provide expert opinion on tumors for the practitioner and skilled treatment for the patient.

The Staff of the Palmer Memorial Hospital has recently been announced:

**Permanent Staff:** Daniel Fiske Jones, M.D., Surgeon; Elliott P. Joslin, M.D., Physician; Shields Warren, M.D., Pathologist.

**Consultants:** D. Crosby Greene, M.D., Laryngology; Arthur M. Greenwood, M.D., Dermatology; George A. Leland, Jr., M.D., Surgery, in charge of Gynecology; L. S. McKittrick, M.D., Surgery; L. B. Morrison, M.D., Roentgenology; Wyman Richardson, M.D., Medicine; George Gilbert Smith, M.D., Urology.

**Associate Staff:** F. Gorham Brigham, M.D.; H. M. Clute, M.D.; Burton E. Hamilton, M.D.; Frank H. Lahey, M.D.; Howard F. Root, M.D.

## REPORTS AND NOTICES OF MEETINGS

### CENSORS' MEETING

The Censors of the Suffolk District Medical Society will meet for the examination of candidates at the Medical Library, No. 8 The Fenway, Thursday, May 5, 1927, at 4:00 o'clock.

Candidates should make personal application to the Secretary, and present their medical diploma at least one week before the examination.

ARTHUR H. CROSBIE, *Secretary*,  
520 Commonwealth Avenue, Boston.

### MASSACHUSETTS GENERAL HOSPITAL

#### CLINICAL MEETING

A CLINICAL meeting of the Staff of the Massachusetts General Hospital will be held in the Administration Building, Fruit Street, on Thursday, April 14, 1927, at 8:15 P. M.

#### PROGRAM

1. Presentation of Cases.
2. Demonstration of High Liver Diets, Miss Nicholls.
3. Disorders of Respiration—Clinical and Experimental Studies, Dr. Carl Binger of the Rockefeller Hospital Staff.

Physicians, medical students, nurses, social workers and dietitians are invited.

COMMITTEE ON HOSPITAL MEETINGS.

## THE MASSACHUSETTS STATE NURSES' ASSOCIATION

BOSTON, MASSACHUSETTS

The monthly meeting of the Norfolk and Suffolk County Branches of the State Association will be held at the Auditorium of Thorndike Memorial, Boston City Hospital, Thursday, April 28th, at 8:00 P. M.

Dr. Henry B. Elkind, Medical Director of Massachusetts Society for Mental Hygiene, will talk on "Mental Hygiene for Nurses." All nurses are invited.

MARY ALICE McMAHON, *Secretary*,  
Boston State Hospital,  
Dorchester Center, Mass.  
April, 1927.

## THE NEW ENGLAND ASSOCIATION FOR PHYSICAL THERAPEUTICS

The next regular meeting of the New England Association for Physical Therapeutics will be held at the Boston Square and Compass Club, 448 Beacon Street, Boston, Wednesday, April 26th, at 8 P. M.

Dr. Elisha Sears Lewis, of Worcester, will read a paper on "Physiotherapy in Middle Ear Disease."

All regular physicians are welcome.

Table d'hôte dinner will be served as usual at the Square and Compass Club at 6 P. M. at the regular price, \$1.25 per plate.

W. K. COFFIN, *Secretary*.

## THE ANNUAL MEETING OF THE MAINE MEDICAL ASSOCIATION

The Maine Medical Association will meet for its Annual Convention in Portland, June 14 and 15, 1927. The convention is to be held in The Eastland, the splendid new Annex of The Congress Square Hotel, situated on High Street and in the very center of the city. A large gathering of the Medical profession from all over the State is expected.

For some years the convention has been more or less indefinite. Last year a fine convention was held at Poland Spring. It is now the purpose of the Association to build up a permanent organization, meeting in turn, once in three years at Portland, Poland Spring, and some other place in the State. The Poland Spring House and the new Congress Square Annex offer exceptional facilities for such a convention.

The hotel management will rent to an association the entire Lobby for exhibits. Dr. William Holt has charge of renting space for exhibits.

## THE ANNUAL MEETING OF THE MIDDLESEX SOUTH DISTRICT SOCIETY

The annual meeting of the Middlesex South District of the Massachusetts Medical Society

will be held on April 20, 1927, at the Colonial Club, 20 Quincy Street, Cambridge.

Business meeting at 11 A. M. The annual oration will be delivered at 12 noon by Dr. Dwight O'Hara, Waltham. Subject: Heritage of Middlesex South.

Dinner at 1 o'clock.

Signed: STEPHEN M. BIDDLE, *Sec.*

## ANNUAL MEETING OF THE NATIONAL ASSOCIATION FOR THE STUDY OF EPILEPSY

The National Association for the Study of Epilepsy will hold its next annual meeting at Cincinnati, Ohio, on May the 30th and 31st, 1927, immediately preceding and in joint session with the American Psychiatric Association. Papers will be read by Doctors Bass of Texas, Syz of Baltimore, Clark of New York, Pollock and Davis of Chicago, Shanahan of Sonyea, Notkin of New York, Sharp of Buffalo, Odell of Clifton Springs and others.

G. KIRBY COLLIER.

## THE WACHUSETT MEDICAL IMPROVEMENT SOCIETY

The April meeting at the Worcester City Hospital was held on the evening of the 6th inst. Address by Dr. A. W. Marsh, "The High Cost of Being Sick."

Interesting and Unusual Cases were shown and reported by: Dr. Frank George, Fractures and dislocations with open and closed operations; Dr. O. Draper Phelps, Unusual Condyloma—The two stage prostatectomy with a very long period between the 1st and 2nd operation; Dr. Ernest L. Hunt, The Thyroid Problem of the Surgeon (much toxemia from a very small amount of tissue)—New Growths in the Abdomen with good post-operative results; Dr. P. H. Cook, Unusual conditions of the cervical and thoracic region, X-ray pictures, very young children; Dr. Margot, Septic terminal phalanx with bone necrosis, operation without shortening of fingers; Dr. Walter Bieberbach, Double ureters bilateral, two cases. Two kidneys on right side, one case.

CARROLL H. RICKER, M.D., *Secretary*.

## THE EDWARD K. DUNHAM LECTURE FOR 1927

The Edward K. Dunham Lecture for the Promotion of the Medical Sciences for the year 1926-27 was delivered by Dr. Richard Willstätter, Privy Counsellor and Professor in the University of Munich, at the Harvard Medical School on the afternoons of March 29 and 30. Professor Willstätter lectured on "Progress in Enzyme Research."

Professor Willstätter opened his lectures stating that life could be considered as a system of



coöperating enzymatic reactions, both organic and inorganic catalysts taking part. There is, however, a great degree of difference between these two classes of catalysts. Many inorganic catalysts have little specificity in their action. Organic catalysts on the other hand are very specific. Not only do they differentiate between the three great classes of foods, proteins, carbohydrates, and fats, but even between substances of the same structure such as sucrose, maltose, and lactose, each one of these substances requiring a special enzyme of its own. Body enzymes are more efficient than inorganic catalysts such as colloidal platinum. It was found that ten million times the concentration of inorganic catalysts was needed to obtain the same results as organic catalysts.

The question arises whether enzymes are in reality individual substances or merely the dispersion of substances already known. Attempts have been made to imitate enzymes by allowing inorganic catalysts to act at the correct pH. These experiments, however, do not disprove the presence of enzymes.

Two experimental facts came to light in these researches. First, the enzymes were analyzed in too impure a state and second, that inorganic catalysts owe their activity to their individual chemical structure. Thus, aluminiumhydroxide in its two forms,  $Al(OH)_3$  and  $AlOOH$  differ in their catalytic action. Enzymatic actions are explained by the structure of the molecule. Insulin owes its efficiency to its action upon gamma-glucose, rather than upon alpha or beta glucose.

The first step in enzyme research is to determine the quantity and purity of the enzyme. The amount of enzyme is not measured directly, but by the produce it gives. The unit of measurements is, in the case of yeast, the saccharide unit, which is the amount of yeast necessary to split 50 milligrams of sucrose into its constituents.

In Professor Willstätter's enzyme research work adsorbed sugars were usually used, substances with large surfaces being preferred. Perhaps by this method such substances as hormones, toxins, and vitamins might be isolated. To separate the enzyme again from the absorbent is called "elution," a new term in the English language. The mode of adsorption shows whether the enzyme is an acid or base. Thus, it was found that saccharase is an acid and trypsin is an amphoteric compound. The behaviour of enzymatic adsorbents is dependent on the chemical peculiarities of the solution.  $AlOOH$  reacts to neither  $HCl$  or  $NaOH$ , while  $Al(OH)_3$  reacts to both. The amount attained by using one gram of adsorbent is called the adsorbent value. Thus, one gram of  $Al_2O_3$  takes 0.15 grams saccharase, which is the adsorbent value. The adsorption varies for the differ-

ent enzymes, lipase being the most easily adsorbed.

Further work on the specificity of enzyme reactions showed some interesting results. The best pH for the work of the different lipases varied. Liver lipase prefers devtro- to levo-rotatory fats in the velocity of the reaction. All lipases differ in the speed of their reactions. Recent attempts are carrying this work still further.

The final note of the lectures was that much work has been done, but much still remains to be discovered.

This lectureship was founded in 1923 in memory of Dr. Edward K. Dunham (M.D. Harvard 1886). Among the useful purposes for which the Foundation was established was that of binding closer "the bonds of fellowship and understanding between students and investigators in this and foreign countries." The lecturers are chosen from "eminent investigators and teachers in one of the branches of the Medical Sciences, or of the basic Sciences which contribute towards the advance of Medical Science in the broadest sense." The lectures, which are given annually, are "free and open to the faculty and students of the Harvard Medical School and College, and all other interested professional persons who may profit by them."

#### MEETING OF THE LYNN MEDICAL FRATERNITY

The Lynn Medical Fraternity held its regular meeting and dinner at Hunt's Grill at 6:30 P. M. on March 29, 1927.

The guest of the evening was Dr. William H. Robey of Boston who spoke upon "The Effects of Tonsillectomy Upon Rheumatic Fever and Upon Rheumatic Heart Disease."

WM. T. HOPKINS, Reporter.

#### SOCIETY MEETINGS

##### DISTRICT MEDICAL SOCIETIES

###### Essex North District Medical Society

Wednesday, May 4, 1927—Annual meeting. Russell Hall, Young Men's Christian Association Building, 40 Lawrence Street, Lawrence.

Thursday, May 5, 1927—Censors meet for examination of candidates at Hotel Bartlett, 95 Main Street, Haverhill, at 2 P. M.

###### Essex South District Medical Society

Thursday, May 5, 1927—Censors meet for examination of candidates at the Salem Hospital, 5:30 P. M.

Wednesday, May 11, 1927—Annual meeting. The Tavern, Gloucester. Speaker and subject to be announced later.

###### Norfolk District Medical Society

Below are the proposed meetings of the Norfolk District for the remainder of the year. Minor changes may be made in case of necessity.

May 10, 1927—Annual meeting. Details of meeting to be announced

###### Suffolk District Medical Society

Meetings of the Suffolk District Medical Society and the Boston Medical Library will be held at the Boston Medical Library.

The Fenway, Boston, at 8:15 P. M., as follows:  
April 27, 1927—Annual meeting. Election of officers.  
"Medical Education in the Orient and Occident," Dr. David L. Edsall, Dean, Harvard Medical School.

Notices of meetings must reach the JOURNAL office on the Friday preceding the date of issue in which they are to appear